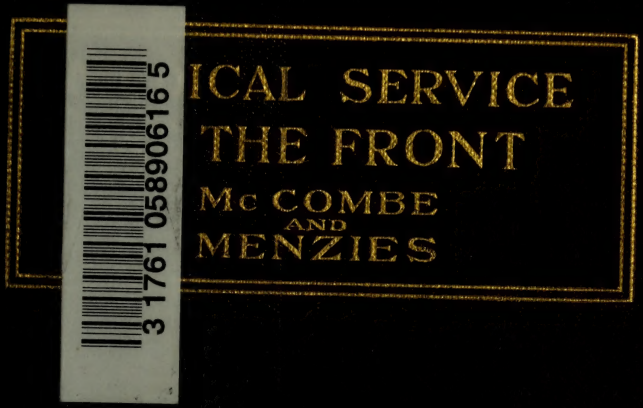

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Medical Service at the Front

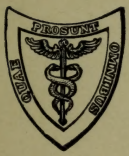
BY

LIEUT.-COL. JOHN McCOMBE, C.A.M.C.

AND

CAPT. A. F. MENZIES, M.C., C.A.M.C.

Illustrated



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TO

THE RIGHT HON. SIR ROBERT L. BORDEN, G.C.M.G.

PRIME MINISTER OF CANADA

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PREFACE.

THIS book was begun at the suggestion of several Canadian friends, who said they thought it would interest many to be told something about their medical service and its arrangements for the care of sick and wounded at the front.

The writers knew that in telling this they were of necessity giving an account of medical activities anywhere along the British line, for just as the Canadians are a fraction of the British force, fighting the same fight in the same way, so the Canadian Medical Service does its part, in beating a brave but disreputable foe, by like methods of work and administration to those adopted by the Royal Army Medical Corps. The task imposed, although apparently not difficult, was therefore of moment, involving, as it did, the careful collection of details, and verification of data.

It thus occurs that this little book, commenced over a year ago, and written under varying circumstances in many places, is only now completed. The authors have endeavored to give the simple facts in a plain way, and trust they may prove of as much interest to brother officers and others as their setting forth has been to themselves.

THE AUTHORS.

FOREWORD.

By Surgeon-General J. F. Fotheringham,
D. G. M. S., Canada.
(Formerly A. D. M. S., 2d Canadian Division.)

Gentle reader, for this great war makes most participants who survive it gentle, and particularly those engaged in repairing its ravages in the bodies and minds of its victims, I can recommend to your favorable consideration and earnest perusal this unpretentious volume. It is hot from hell's gridiron and correct in all its details, as all can vouch who have been through the experience of those who wrote it. It beautifully lacks self-consciousness, but is not without a living personal element. It can therefore not be called a text-book, but is reminiscent of Hippocrates, who, though a heathen, produced four hundred years before Christ a Christian document through his contact with the sick and wounded.

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MEDICAL SERVICE AT THE FRONT.

A DIVISION IN THE FRONT LINE.

In order better to understand the work of a medical service on the Western front, and more fully to appreciate the problems met by the army medical corps, it is important to have some knowledge of military formations.

The unit of military calculation is the division, and upon it is built the whole structure of army organization. It is a self-contained and mobile force, and is styled a division of all arms as distinct from a cavalry division, which is a very different thing. The composition of this army prototype is interesting, and its main features may at first be more easily grasped by reference to a rough diagram (Fig. 1), which illustrates the prominent factors in the organization of any fighting force.

The first group contains the immediate striking strength, as here exemplified by infantry, artillery and engineers. As such a body must be supplied with ammunition, equipment, food and other necessaries, full provision for carriage by motor lorry and horse transport, arranged under column, train and subpark, is made and forms the second group.

The need that sick and wounded be promptly removed is almost as urgent as the need of supplies

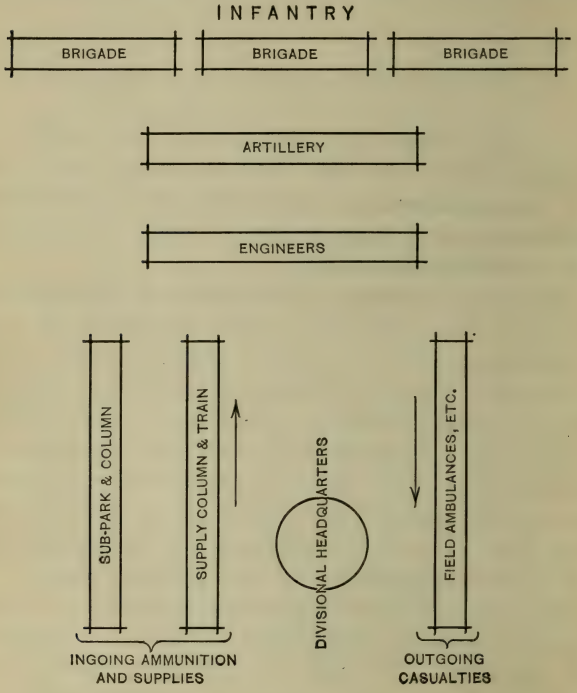


FIG. 1.—The inward movement of reinforcements is not indicated but would follow the route of supply column and train.

or ammunition, so that the means whereby the lines are kept clear of casualties by field ambulances

and other medical arrangements form the third group. In order to control, coördinate and guide the various groups of this military scheme there is a divisional headquarters that issues its orders to the lesser headquarters of their several members, while itself receiving instructions from the higher headquarters of the corps.

The first group should be closely associated in the mind with the present work in the trenches, or near them, and for this purpose certain facts (illustrated in Fig. 2) must be remembered.

The front line or fire trench is seen to connect at frequent intervals with the support line by means of communication trenches. As these communication trenches are followed back, many are found to coalesce and so become greatly reduced in number by the time the reserve trench is reached, while between it and the third line of defence they usually disappear. From the fire trench saps run out into No Man's Land and are used for snipers or listening posts. A tambour is also shown. It is merely a trench curving forward in front of the fire trench, and is generally inhabited by snipers. In the early days of the war it was often used for trench mortars, which had not then much range, but is now chiefly interesting as being a bad place to get into. The support trench is placed 100 or 200 yards behind the front, and with it forms the first line of defence. The reserve trench, from 600 to 1200 yards behind

the support, is the second line of defence. Along it are scattered strong points or redoubts, which are

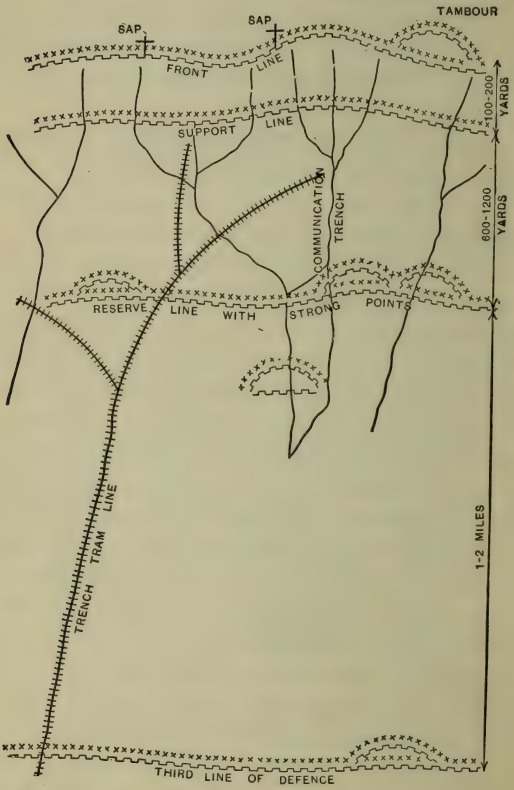


FIG. 2.—Trench system. Strong points are shown as semicircular projections.

spots selected on account of some natural strength. They are fortified and have in many cases a concrete machine-gun emplacement. The third line of defence, also known as the second reserve line, is placed about one or two miles to the rear of the reserve trench. It is well constructed and has many strong points, in carefully chosen positions, but is not held until an enemy offensive may render it necessary to do so. The trench tramway is used to transport materials and rations to the lines, and, on occasion, bring back the wounded. In favorable situations its track may be extended as far as the support line. At the end of each branch there is an engineers' dump of trench materials.

Such being the conventional arrangement of the ground occupied by the striking force of a division, the distribution and employment of its different arms may be followed.

THE INFANTRY, holding the various lines, is divided into three brigades. A brigade is composed of 4 battalions, a machine-gun company, a light trench motor battery and a headquarters.

The battalions represent the attacking power of the brigade, and it is therefore of some importance to remember their approximate strength. Nominally, each has 1030 men, but the actual fighting strength consists of 4 companies of about 210 men, together with a machine-gun section of 8 guns and 40 men. The remainder are employed on various

duties necessary to maintain or conserve the fighting power of the others, as those of transport, kitchens, sanitation, etc.

The machine-gun company is a defensive unit, usually selecting positions in support and reserve lines which give a good field of fire, and thus the likelihood of stopping an advancing enemy. Like some other military units whose larger sphere lies in defensive measures, it also assumes the offensive, and its chief occupation during periods of trench warfare is indirect fire on communication trenches and roads used by the enemy. During a push forward it moves with each advance and takes up a new defensive position, then picks out centers of activity behind the enemy lines, which might be benefited by indirect machine-gun fire. It has 16 guns and about 200 men.

The light trench mortar battery, also known as the Stokes' gun battery, has positions for its guns in or near the support line, from which it fires on enemy trenches and assists in forming a barrage for the infantry attack. During an offensive it moves forward as soon as possible after an advance, in order to be in a suitable position to cover the infantry and take part in further developments. Following the general rule of battery strength it may be said to have 6 guns.

The brigade headquarters is an epitome of the divisional headquarters, but is responsible in more

detail for the active policy and work of the troops concerned, while receiving instructions in regard to the larger issues from the division.

THE ARTILLERY is made up of 2 field artillery brigades, a medium trench mortar battery, a heavy trench mortar battery, the ammunition column and a headquarters.

The field artillery brigade usually has its positions some distance behind the reserve line, and is composed of 4 batteries; 3 of these have 18-pounder guns, which are used against the enemy trenches and on enemy infantry when caught in the open. The fourth has howitzers, which also do trench work, but in addition are frequently engaged in counter-battery fire.

The medium trench mortar battery, which joins the light in the support line, takes part in the beginning of an offensive, and makes an attempt to follow it. If the advance is held up for a day or two it tries to get into position in order to have an opportunity of knocking out enemy strong points.

The heavy trench mortar battery, placed only a few hundred yards behind the medium and light, is essentially a trench warfare unit. It takes part in preparation for an offensive, but as soon as a first advance is accomplished it ceases to play an active part, which is only resumed when trench warfare is again established and these heavy guns can be moved forward.

The ammunition column, although belonging to the artillery, also carries ammunition to the infantry and comes under the further description of the second group.

The artillery headquarters is again a step in authority and guidance transmitted downward to it from the division and from it to each artillery brigade headquarters and the trench mortar batteries.

THE ENGINEERS are composed of 3 field companies and a headquarters. Each company has an approximate strength of 230 men. During trench warfare they supervise and assist in such work as the construction of dugouts and trenches in the line, together with bridges, huts, etc., in the area behind it. During an offensive they bridge trenches, streams and other obstacles and make "strong points" in the captured ground.

With this group must be associated the pioneer battalion. It has the same organization as an ordinary infantry battalion, even to its machine-gun section. Its transport is, however, larger, as a certain amount of technical equipment is carried. A fair proportion of its men are also trained artificers. During trench warfare they are responsible for the construction and upkeep of the second line of defence, while they also do work similar to the engineers in the trenches. During an offensive they repair roads, dig communication trenches behind

the line and jumping-off trenches in front of it. From all this it will be seen that the duties of the pioneers are very similar to those of the engineers, and they might indeed be called amateur engineers. In addition to this they also act as a reserve battalion, and the general officer commanding the division may call upon them at any time in the event of heavy casualties occurring.

This completes the more detailed account of the group closely engaged in the business of fighting the enemy. From such description it is further evident that the divisional headquarters, having direction of all, must constantly be kept in touch with the work in hand. The signal company, responsible for the establishment of communication by telephone between divisional, brigade and other headquarters, must therefore be added. This company is also in charge of the routine letter service between divisional units, and between division and corps. It is divided into 4 sections, one being for divisional headquarters and one for each brigade.

The group engaged in the transportation of ammunition and supplies is shown in Fig. 3. Its members appear at first sight a little difficult to understand, but a glance at the conditions to be met quickly affords an explanation. Supplies are usually put down at the most convenient railway station or siding, which is therefore called rail head

by the particular division concerned. These supplies are then conveyed by motor lorry to a point as near the division as good roads and safety will

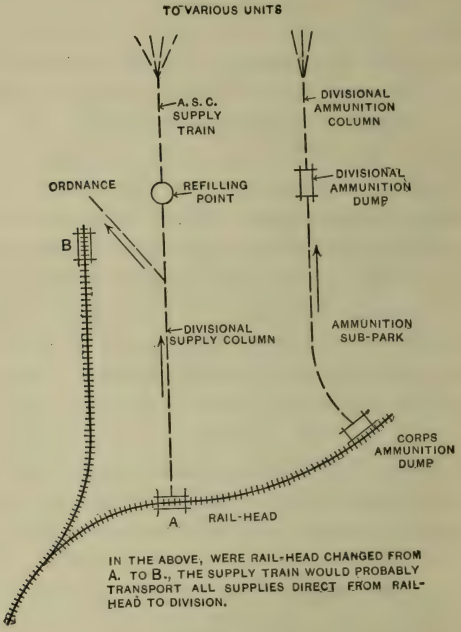


FIG. 3

allow. Such a place is termed the refilling point, and from it only horse transport can well be used. General service wagons, therefore, carry the supplies to various units for which they are severally

responsible, the horse lines of such units being the designated place where delivery is made.

To perform this work there are the divisional supply column with its motor lorries and the army service corps supply train with general service wagons. The former carries from rail head to refilling point and the latter from refilling point to various units of the division.

The divisional supply column having hauled from rail head to refilling point, the stores are unloaded and a dump formed beside the road. If such a dump were inspected it would be found that all the bread for the division was in one pile, all the bacon in another, all the fresh meat in a third and so on until hay and oats completed the line. The wagons of the supply train pass along the dump and receive from each pile the proportion required by the units for which they are responsible. The train is divided into 4 companies, 1 company being responsible for the artillery and various other divisional units, while 3 look after the infantry brigades.

An exception to the usual arrangement of motor transport to refilling point must be noted in cases where the rail head happens to be close to the division. In this case the supply train frequently draws the supplies direct, thus freeing the column lorries to do other divisional work.

In addition to the supplies mentioned there is certain equipment stored for use of the division.

This is conveyed entirely by the supply column to the ordnance depot, which is placed at a convenient point.

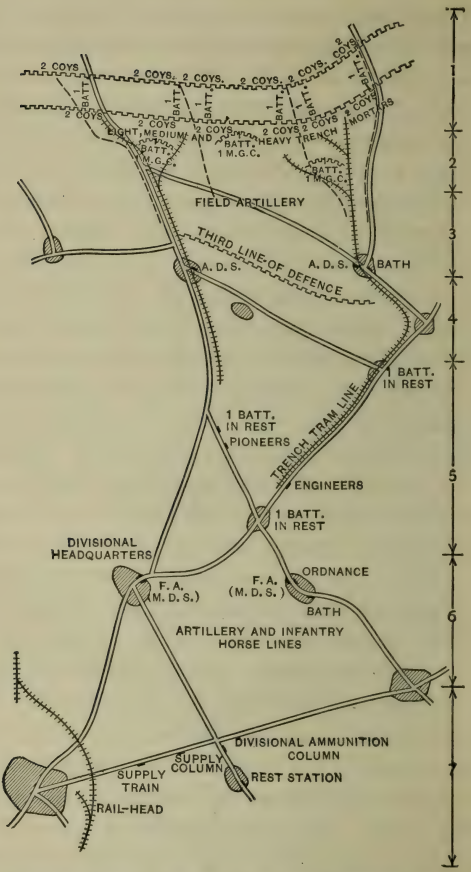
The supplies being duly delivered to the horse lines of the receiving unit may be traced a little farther. From the artillery horse lines the rations are taken to the batteries with the ammunition at night; from the infantry horse lines, in limbers, to the head of the communication trenches. Here the fresh meat is cooked and an attempt is made to have stew taken to men in the trenches each day at noon and hot tea at night. The dry rations are taken by trench tramway, also under darkness.

The transport of ammunition is now more easily understood. Two means of conveyance are likewise necessary, the one by motor lorry, which is called the ammunition subpark, the other by horse wagon, which is the division ammunition column, and has already been mentioned as belonging to the artillery. For convenience, ammunition is sometimes stored in a corps ammunition dump instead of at rail head, but wherever it may be it is the duty of the ammunition subpark to convey it to the refilling point, or, if established, to a divisional dump. From either place it is then transported by the divisional ammunition column to the horse lines of artillery and infantry brigades, from which it is moved forward by night to the guns in the first case and the communication trenches in the other.

The foregoing account of a division and its machinery clears the way for the remaining group, which is concerned with the disposal of wastage as represented by sick and wounded. It also gives some conception of the varied clientele, numbering from 20,000 to 30,000, who, even while at rest, and therefore free from ordinary war casualties, require continued care and supervision. Under all conditions, whether during rest, in the trenches, or at battle, the field ambulances, of which there are 3 to a division, play the most spectacular and probably the most important medical role, yet for their success are largely dependent upon the efficiency of the regimental medical officers and their aid posts. The motor ambulance convoy, which also greatly assists by its coöperation in the rapid evacuation of wounded from field ambulance to casualty clearing station, must be included as a member of this group. As the subject of medical arrangements fitted to meet the difficult tasks imposed upon them in the division is the purpose of this book it is unnecessary to give further details here.

With the object of making the foregoing description more definite, Fig. 4 represents an area occupied by a division during a period of trench warfare.

Under the conditions which now exist on the Western front, the distinction between trench warfare and an offensive must be clearly recognized, as not only divisional, but also medical arrange-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ments alter very considerably when one changes to the other. Ordinary trench warfare, when the line is held and the day's work varied only by raids and so forth, is frequently called peace warfare, or inactive warfare, whereas an offensive is battle or active warfare.

In peace warfare a division generally occupies a three-brigade front, while during an offensive there are either two brigades in front with one in the support line, or one in the front, one in the support, and one in the reserve line.

The diagram illustrates a division occupying a three-brigade front and shows the relative position of its units. For the purpose of description the area is divided into zones, the reference numerals being placed at the side of the map.

The first zone comprises the front line and its support. These are held by 2 battalions of each brigade, each battalion having 2 of its companies in the fire trench and 2 in the support, while its machine-gun section is divided between them. In the support line, or immediately behind it, are the light, medium and heavy mortars.

The second zone consists of the reserve line, composed largely of strong points, and is held by 3 battalions, 1 from each brigade, together with the 3 machine-gun companies, collected mainly at these points.

The third zone includes the area immediately

behind the trenches, and in it the field artillery have their gun positions. The advance dressing stations of the field ambulances are frequently found here, and there is sometimes a bath-house for troops in the reserve line.

The fourth zone has the third line of defence, which it will be noted does not follow the salients of the front but is constructed along a selected defensive position. As before stated it is not held until necessary.

The fifth zone is occupied by the engineers and pioneers, who live in hutments and go up to the trenches daily as working parties. Here also are artillery headquarters as well as the remaining 3 battalions in rest from the brigades.

The sixth zone contains the divisional headquarters, the field ambulances, ordnance, and the horse lines of the various units of the divisions.

The seventh zone holds the supply column and train, together with the divisional ammunition column. The ammunition subpark is usually a mile or two behind the area shown. Rail head may also be situated in this zone.

THE REGIMENTAL MEDICAL OFFICER.

THE regimental medical officer is a person of protean pursuits. His interests reach from the cleanliness of the cook's hands to the care of wounded under fire. He legislates equally on water chlorination or trench fever. He replies to queries ranging from "How many men with itch reported at sick parade?" to "Considering the number of gas shells that fell around trench 3 this morning, is it safe to relieve the company tonight?"

On analysis his duties, like all medical activities, fall under either of two headings, the one preventive, the other curative. In the first category are such important subjects as water supply; food and kitchen arrangements; conservancy, with sanitation of camps or billets; the general comfort and cleanliness of the men. In the second are proper attention to sick and wounded, including such matters as careful selection of the regimental aid post; instruction and control of stretcher-bearers and medical orderlies; the conduct of the morning sick parade, with thoroughness and acumen. Involving these, and at times of paramount importance, is the duty on the part of every medical officer to further the unhampered action of the

fighting force by keeping its lines clear of sick and wounded through rapid evacuation of casualties to the rear.

In the performance of his duties the regimental medical officer has the assistance of certain non-commissioned officers and men detailed to such employment from the battalion and under his authority. From above he receives help and instruction from two sources: the assistant director of medical services, who is the senior medical authority of the division, and the commanding officer of his battalion. This dual control is baffling only in such exceptional cases as those in which the medical officer has a difficult officer commanding or where he himself is perverse or tactless. Its necessity and obligations arise from the fact that the regimental medical officer, although with the battalion, is in a sense not of it. He is a professional expert lent, or what is technically known as "attached," by the army medical corps. Being so attached he naturally comes under the authority of the officer commanding in all matters relating to military discipline, while on the professional side he looks to his immediate medical superior, who is the assistant director concerned, for guidance. As the officer commanding is responsible for the welfare of his unit, all matters of any importance in regard to preventive medicine must be brought to his attention in order that action may be taken. From

knowledge of military conditions which this officer possesses, he may not consider it expedient to adopt certain recommendations made by his medical officer, but in the neglect of such he becomes accountable for any evil consequences that may occur. In carrying out the curative part of his duties, involving the use of his art in the treatment of sick and wounded, the medical officer cannot be interfered with and is alone responsible.

The selection of an aid post is a matter over which some divergence of opinion may possibly arise. At the beginning of an offensive, for instance, the assistant director of medical services may instruct the regimental medical officer to locate somewhere in a small area denoted by a numbered square on the map. With an advance it may be necessary to establish it farther forward, and with the consent of the officer commanding the medical officer makes the move, but must duly notify his assistant director of same. At times these authorities do not agree as to the best site, in which case the medical officer must obey the written instructions of the assistant director and leave him to fight it out with the officer commanding. Another occasional cause of discord between the assistant director and commanding officers is that the latter, if at all fussy, are anxious to have the medical officer frequently in the front line, whereas the assistant director must conserve his medical men,

and sees no particular reason why they should be in the fire trench instead of attending to casualties as they arrive at the aid post.

The regimental aid post is the doctor's office to the little community of which he is medical officer. In it is held the morning sick parade, when patients are given advice and medicine and minor dressings are done. They are paraded according to company, and any who are found to be at all seriously ill are at once transferred to the field ambulance for further treatment; others may be returned to full or light duty or instructed to report back for dressings, while occasionally one or two may be held at the post for observation. During a period of active operations, dental, eye and skin cases are not dealt with, but other sick are seen in the ordinary way, except on the day or days of an attack, when only those seriously ill are supposed to be sent for treatment.

Here, too, the wounded come, or are carried by the regimental stretcher-bearers, for attention before being evacuated by way of the field ambulance stretcher-bearers to the nearest advance dressing station. The position of the aid post must therefore be carefully chosen, with a view to convenience and as much safety as possible, both for casualties coming in and those being sent to the rear. It is frequently situated off a communication trench, but may be in the support or reserve line.

A good idea of such an outpost will be gained from the accompanying drawings.

Fig. 5 illustrates a dugout beside a communication trench and its cross-section. The roof is constructed of elephant frames of corrugated iron, while the walls are built up by sand-bags held in

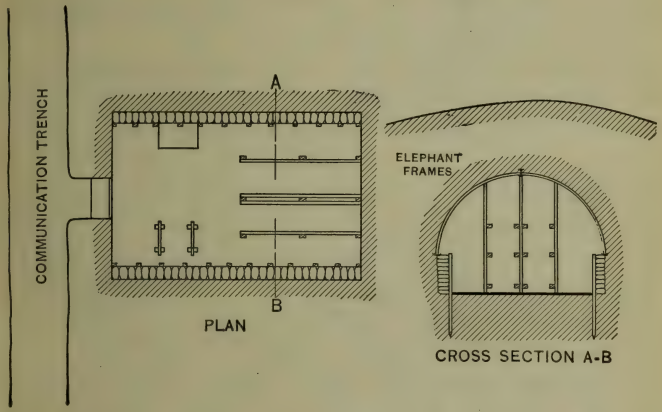

FIG. 5.—Dugout. Ground plan and cross-section, showing accommodation for twelve stretchers in racks, etc.

place by stakes driven into the ground. Racks to hold six stretchers are made, together with a pair of trestles to support the stretcher while the patient is being attended to. A table for dressings and instruments, a primus or other stove, and, if there be room, a bench for walking wounded, complete

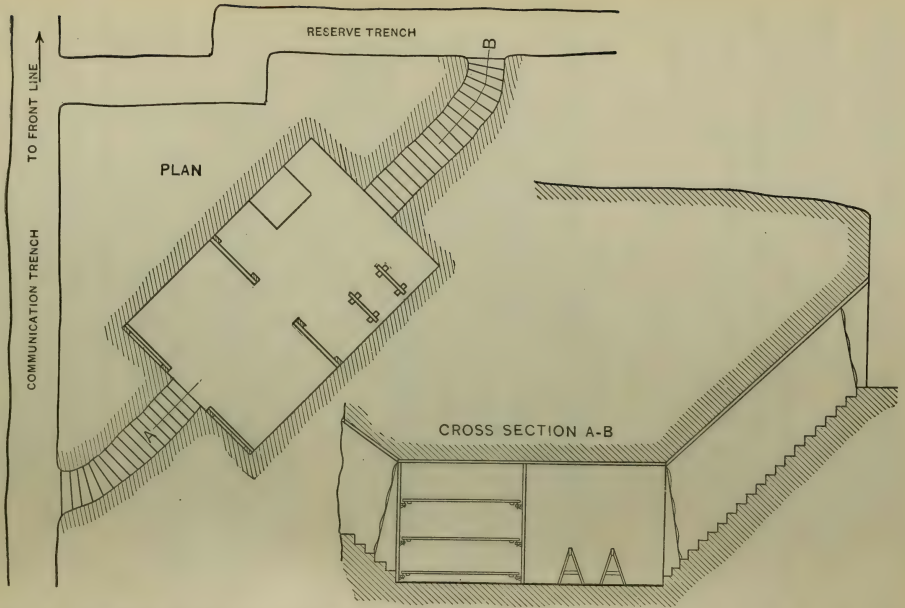

FIG. 6.—Ground plan and cross-section of deep dugout, showing gas curtains guarding entrance and exit; trestles to support stretcher while patient is being attended to; racks for stretchers.

the furniture. This type of shallow dugout is probably the safest and most comfortable that can be had, its only disadvantage being that it is very narrow.

Fig. 6 shows a deep dugout with its entrance in the support or reserve line and its exit into a communication trench. The exit and entrance shafts as seen in the cross-section are protected by gas curtains. The advantage of such a dugout is that, for all practical purposes, it is shell-proof, and even though small, when once constructed it can be enlarged by digging a tunnel at right angles to the length.

Established in a stretcher-bearer post near the aid post are bearers from the field ambulance, who convey the casualties from such post to the advance dressing station. In these posts there are racks for stretchers, which allow of casualties being held until they can be carried back with some safety. Their close proximity to the regimental aid post is shown in Fig. 7. From the cross-section an idea of the arrangement is obtained. Each is protected by gas curtains and holds six stretchers. The great advantage of these posts is that they are small and consequently but seldom hit; their disadvantage is that practically no arrangement can be made for heating them.

Having duly established his regimental aid post the medical officer has the help of two medical orderlies, one a non-commissioned officer, either

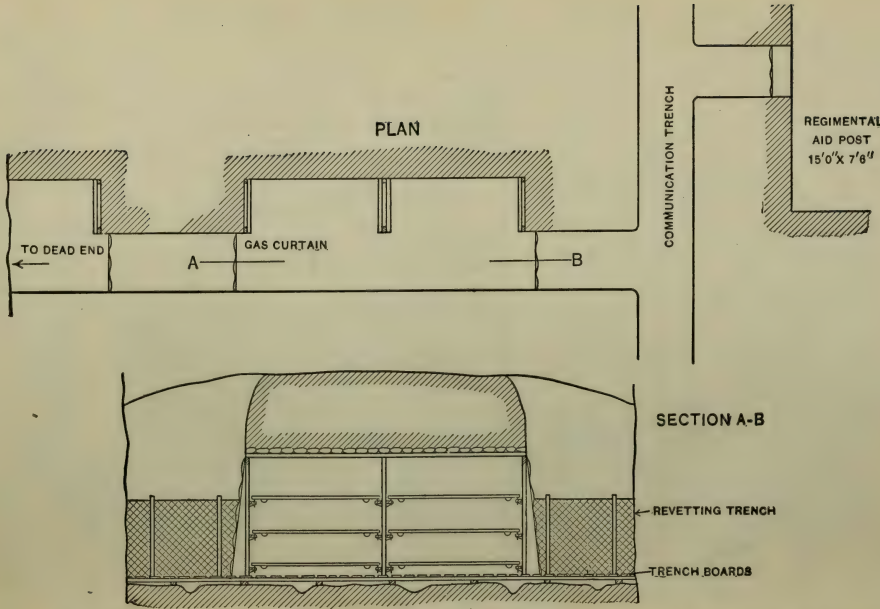

FIG. 7.—Ground plan and sectional elevation of stretcher-bearer post. These posts are multiplied as necessary toward dead end of trench.

sergeant or corporal, the other a private. They assist him in attending to the sick and wounded, are responsible to him for the care and cleanliness of the post and have charge of his medical stores. In addition, 16 men, with a corporal, act as regimental stretcher-bearers. When the battalion is in rest these usually form the band; when in the trenches they live with the companies from which they are detailed for duty. They work in pairs with their own companies, render first aid to the wounded, and guide or carry them to the aid post.

During an offensive, so long as the wounded continue to arrive in fairly large numbers, the medical officer remains at the aid post to deal with them; but should he have reason to think conditions are becoming unsatisfactory, either from the reports of bearers, or judging from the smaller number of wounded arriving, he must investigate the situation. The questions which he asks himself, and to which he must find the answer, are:

1. Have nearly all the wounded been brought in?
2. Have the stretcher-bearers, as the result of a successful attack, to carry the casualties too far?
3. Has it been an unsuccessful attack, and in consequence are the bearers unable to reach the wounded?

He endeavors to obtain information from his regimental headquarters as to the position resulting from the attack; also through the companies, par-

ticularly in case of an unsuccessful attack, and by personal reconnaissance, he must learn if wounded are lying out in No Man's Land. In this case he issues the necessary instructions to stretcher-bearers for their collection or he may apply to the field ambulance for assistance. If he finds that the battalion has advanced some distance he may consider the moving forward of his aid post to be advisable. If so he selects a new site, waits for a quiet period to move to the advanced situation and digs in. He should benefit by knowledge gained before the offensive respecting new locations for his aid post.

As the wounded arrive at the regimental aid post they are seen and attended to by the medical officer. His chief concern is to stop bleeding and make the patient comfortable. His methods of arresting hemorrhage are, in order of importance:

1. Tight bandage.
2. Tying arteries.
3. Plugging.
4. Tourniquet.

Tourniquets on the whole do more harm than good and should only be used where amputation is absolutely necessary. Nearly all patients sent back with tourniquets applied are in pain and the wounds are bleeding. In 90 per cent. the bleeding ceases and the pain is relieved when the tourniquet is removed.

Having applied the "first field" or other suitable dressing his means of making patients comfortable are:

1. Splints for fractures.
2. Morphin if necessary.
3. Blankets under and over patients.
4. Hot bricks or hot-water bottles.
5. Hot drinks.

This is the extent of treatment which should be given at the aid post, and the patient is evacuated to the field ambulance as soon as it appears fairly safe to do so, his name and number having been previously taken for the casualty roll, which is forwarded later for the information of the battalion.

The regmental aid post, even under the best conditions, cannot provide the facilities necessary for aseptic surgery, and operative work which goes further than tying a spurting artery, completing the amputation of a shattered limb by cutting through a few strands of muscle and strips of skin, or doing emergency tracheotomy, is to be deprecated.

It has been urged that major operations should be done by the regimental medical officer at his aid post, but this, like so many other things, is entirely a matter of geography. On the Western front, where the severely wounded can reach a large and well-equipped casualty clearing station within

two to six hours, such operative procedure should be condemned, while in other theaters, where days may elapse before patients arrive at hospital, much can be said in favor of immediate surgical interference, even of a fairly extensive kind.

When the battalion moves from the front into the reserve line the duties of the medical officer vary to a slight extent. Not expecting so many wounded he has rather more freedom of movement. The men are usually able to get out, one company at a time, for a bath and fresh underclothing. He should, if possible, go with them and see that the clothing they receive is clean, inspect for scabies and look for signs of bad feet.

When the battalion moves into rest he encourages men with minor ailments, such as sore heels and boils, to report sick, and sees that they return frequently for dressings in order to get them fit for the next tour of duty in the trenches. He finds time to train his sanitary men and stretcher-bearers in their various duties, teaching the former the work of the latter, so that in action he may use them as a reserve to call upon in case of casualties among the stretcher-bearers.

He has, too, an opportunity of inspecting the cook-house and the food, and it is his concern to see that food is protected from flies in hot weather, that the cook-house and cookers are kept clean and that the men get as much change in their diet as

possible. This last point may involve the provision of fresh vegetables and lime juice. In all this a good deal of tact is necessary lest he run foul of the quartermaster, with whom he only comes in contact during these periods of rest, and who is responsible for food and feeding arrangements. Antagonism between these two can result only in detriment to the men.

In carrying out the preventive part of his work the medical officer is deeply concerned with water supply. It may be taken, as a general rule, in the area of operations in France, that all water must be chlorinated before it is safe for drinking, and in practice one tries to find a clear supply which does not require more than two scoops of chloride of lime per water-cart to neutralize its organic matter. The medical officer must investigate every source of supply and advise his commanding officer of the results obtained in order that instructions may be issued as to what sources shall be used for drinking and cooking and what for ablution and bathing. During an advance over ground captured from the enemy, troops are not permitted to use water from any well until it has been tested both for the presence of metallic poison, which is rare, and for pollution, with organic matter, which is common. The medical officer reports his findings, and if the supply is found fit for drinking a notice to that effect is put up. To assist him in the proper

chlorination and care of the water supply he is provided with 1 corporal and 4 privates who are trained in water duties. At the beginning of the war these, like the medical officer, were detailed from the army medical corps, but at the present time they are obtained from the battalion and trained by the regimental medical officer.

In the prevention of disease the proper disposal of refuse and excreta ranks next in importance to water supply, and the medical officer must be an investigator and critic as to the sanitary righteousness of his battalion. To aid in this general sanitation he is allowed the assistance of 1 sergeant and 8 privates, who are also drawn from the battalion, but are responsible to him.

The proper care and comfort of the men also come within his prophylactic purview, and he must not neglect the duty of discussing such matters, in his advisory capacity, with the commanding officer. In order that his opinion may be of value he should at all times be familiar with the conditions under which the men are living.

The regimental medical officer has, for the sake of better illustration, been described as if attached to one of the infantry battalions. It must, however, be understood that artillery brigades, and certain other divisional units, also have their medical officers, whose duties are essentially the same as those enumerated; but in these units, with the

exception of the pioneer battalion, no stretcher-bearers are provided.

During an offensive the medical officers belonging to the divisional ammunition column, pioneers, etc., have comparatively little work to do, and are frequently made available to supplement the hard-pressed personnel of the field ambulances. There is of late a tendency to eliminate medical officers attached to the more peaceful units, whose sick or injured are thus compelled to attend the nearest dressing station of a field ambulance for treatment.

For the sake of clearness, it may be well to recapitulate in tabular form the personnel which the medical officer has at his disposal, together with their duties.

PREVENTIVE.		RESPONSIBLE FOR:
Sanitary duties	1 sergeant 8 men	Disposal of refuse. Condition of latrines, etc. General sanitation of camp.
Water duties	1 corporal 4 men	Water obtained from proper source. Chlorination of water. Care of water-carts.
CURATIVE.		
Stretcher-bearers	1 corporal 16 men	First aid. Direction and carriage of casualties from lines to regimental aid post.
Medical orderlies	1 sergeant 1 man	Attention to sick and wounded at regimental aid post. Care of aid post. Charge of medical supplies and equipment.

THE FIELD AMBULANCE.

THE field ambulance[1] is a unique medical arrangement, so constituted that, as a whole, it can establish itself quickly in any selected place, but yet capable of allocating several of its parts to carry on a separate, though not independent existence, and perform duties in different localities. Such mobility and elasticity is not only used to full advantage, but sometimes a little imposed upon by the division; hence a field ambulance has been known, at one and the same time, to be engaged in such manifold employment as running a rest station, a laundry, an advance dressing station and a respirator factory. Its very adaptability to meet conditions in the field renders it susceptible to other than its normal activity of clearing the line of sick and wounded. The plan that contrives to allow such reaction to circumstances deserves examination.

The task of the field ambulance is twofold; not only must it render the care and treatment urgently required, but must also convey casualties from the regimental aid posts and the line generally to its main dressing station for attention. In order to

[1] A field ambulance, termed by our American allies a field hospital, must not be confused with an ambulance wagon.

meet this double demand a cleavage into medical and transport sides is made, these being respectively known as tent and bearer divisions.

Such a separation, although sufficient to provide a field hospital and afford proper transportation of the wounded to it, yet lacks a certain freedom to meet the changing position of warfare. For example, the tent division might occupy a suitable place to give early attention to casualties brought from the trenches, but with a change in the line, resulting in more distant fighting, it loses close contact, and some intervening station becomes necessary. Thus it occurs that to enable the field ambulance to work in echelon the tent and bearer divisions are again split into three parts called subdivisions "A," "B" and "C."

The medical personnel, consisting of 9 medical officers, 1 of whom commands, 1 quartermaster and 182 non-commissioned officers and men, may thus be shown (Fig. 8) as first separated into tent and bearer divisions. The former, on the left of the figure, has 6 medical officers, 1 quartermaster and 58 other ranks; while the latter, on the right, has 3 medical officers and 124 other ranks. Each of these main divisions being further arranged in three subdivisions, the personnel of each is indicated.

The combination of a tent subdivision and a bearer subdivision is called a section, and, therefore, as shown in the figure, we have sections "A," "B"

and "C" each made up of a medical linked to a transport subdivision.

The elasticity of the whole will be appreciated when the easy interlocking permitted by the composition of the several segments is understood.

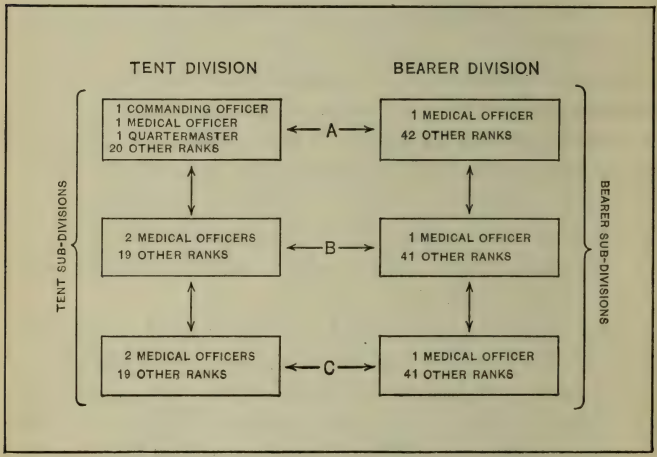

FIG. 8.—Field ambulance. Arrangement of medical personnel.

Any combination that can best cope with the affair in hand may be formed, keeping in mind that the administrative center always remains with the commanding officer, who is nominally in tent subdivision "A." A couple of examples may be given: In peace warfare "A" section may establish a

main dressing station while "B" section is detached to operate a scabies hospital and "C" section to run an advance dressing station. During an offensive all three tent subdivisions would probably form the main dressing station while all the bearer subdivisions go forward to work an advance dressing station. As here suggested a general rule (frequently broken) is that in peace warfare a field ambulance works by sections, in active warfare by subdivisions.

A field ambulance necessarily requires ambulance wagons, both horse and motor, which together with other transport are provided by the army service corps, so that in addition to the purely medical personnel, already considered, there are chauffeurs, drivers, grooms and farriers, amounting to about 50 in all, drawn from the same source and attached to the field ambulance for duty. Such transport and personnel are detailed to tent and bearer subdivisions as occasion demands; the general scheme of distribution can, however, be given as in the completed establishment shown in Fig. 9. An interesting point in this connection is that a medical orderly being required on each of the 10 ambulances and 1 for each of the 3 water-carts, all are taken from bearer subdivisions. When these are deducted there remain 1 sergeant and 36 men in each bearer subdivision, thus forming 9 squads of 4 men each for stretcher duty.

It is well to remember, together with the foregoing, that the tent subdivisions, representing the

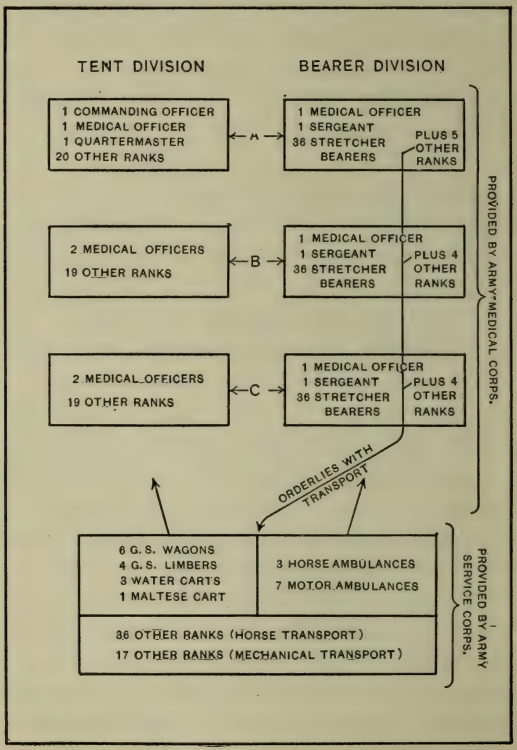

FIG. 9.—Field ambulance. Arrangement of complete personnel, showing those attached from army service corps, together with transport.

hospital side of the scheme, have each an operating tent and four bell tents as provision for patients. These collectively accommodate something over a hundred casualties, which can be increased by the use of tarpaulins to the official number of one hundred and fifty. On the other hand, each bearer subdivision has as many wheel-stretchers as it can get and hold on to. All that remain to be added are the necessary medical stores and equipment, and the structure of the field ambulance is complete. Its functions have yet to be described.

THE FIELD AMBULANCE IN PEACE WARFARE.

An assistant director of medical services is responsible for the work of the army medical corps in each division. For the collection, care and evacuation of the sick and wounded he has three field ambulances in addition to the regimental medical establishments. He is the arbiter of their movement and assigns both the amount and character of the duties which each ambulance shall perform.

In order that this may be done to the best advantage he obtains information on certain important points when the division takes over a new part of the line. He ascertains if they are to occupy a one-, two-, or three-brigade front, the last being the most likely during periods of trench warfare. He then finds out how many and what description of roads give access to this front; and here map-reading must be supported by a mastery of local geography, only to be gained by personal observation. With adequate knowledge of these conditions he can determine how many advance dressing stations are necessary to clear the lines and the positions in which they may best be placed to accomplish this

with a reasonable amount of safety. In selecting sites for his main dressing stations it is also very important that the traffic map be understood, as it is essential that they be established beside a road on which traffic flows away from the front and not toward it.

He will learn if the corps has made arrangements for a rest station to clear its several divisions of sick and wounded that are expected to be fit for duty within a couple of weeks. Likewise he will know if the corps provides a hospital for the treatment of scabies. If either or both of these be operated by the corps, he inquires as to what part or parts of his field ambulances must be contributed as his share in the work. If, on the other hand, the corps has made no arrangements for a rest station or the treatment of scabies he must look for suitable places in which to establish a divisional rest station and scabies hospital and decide what parts of his field ambulances shall be detailed to provide the necessary personnel.

From a sanitary stand-point he is also interested in the bath and laundry accommodation for the division; and if he be a pliable assistant director, may have to supply a portion of an ambulance, which is not fully occupied, to perform such pseudomedical duties as the operation of these establishments.

Of the many parts which a field ambulance in its

time may play, those of purely medical import during peace conditions in the division are:

1. An advance dressing station.
2. A main dressing station.
3. A divisional rest station.
4. A divisional scabies hospital.

THE ADVANCE DRESSING STATION.—This station is located near a road at a point where fairly safe conveyance by vehicle begins. Its site might be called the temporary road head for ambulance transport. It is therefore as near the front as good roads and enemy shell fire will permit. To it the sick and wounded are brought from the regimental aid posts, which it clears by stretcher-bearers, and usually by night. From it they are evacuated by ambulance at any time. The bearers may, of course, be assisted in their work by horse or light motor ambulances which push ahead under favorable conditions, but this is not the rule, and regular wheeled transport only commences at the advance dressing station.

As previously stated, there is a bearer post in the trenches adjacent to every aid post, to which is assigned a squad of 4 field ambulance stretcher-bearers, supplied by the advance dressing station. Stretcher cases are handed over to these bearers by the regimental medical officer and carried by them toward the dressing station. The distance which they can comfortably accomplish varies with

ground and weather, an average being 800 to 1000 yards. Relay posts are consequently established at fair intervals, each manned by its complement of 4 bearers. These take over the casualty from the others, and so the patient's journey to the rear is continued. When the regimental aid post hands over the sick or wounded man with his equipment to the field ambulance stretcher-bearers it receives a stretcher and blankets in exchange for those which go with him. This exchange is carried out at each stage of the patient's journey to the advance dressing station, and if he be comfortable and his wounds do not require further dressing he will in all probability reach the casualty clearing station on the same stretcher and in the same blankets with which he left the regimental aid post.

The plan of an advance dressing station progresses from the most simple, as in that first established in a newly captured area, to the elaborate arrangement of old standing. The latter generally occurs under peace warfare, but it will be more comprehensive if the different grades be here described and illustrated in the accompanying figures.

The first three of these show what may be done when time does not allow of extensive work. If a dressing station has been established, as in Fig. 10, an attempt should be made to construct some sort of shelters, as in Fig. 11, or better still, a rough

dugout, as in Fig. 12, just as soon as a lull occurs in the fighting. It is imperative that something be got up at the earliest moment which will afford

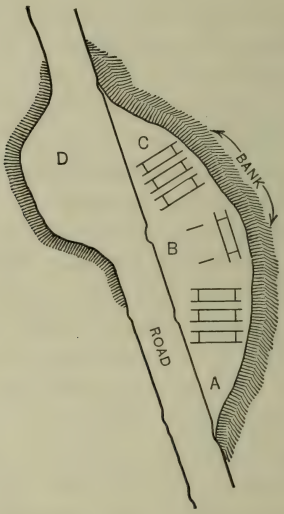

FIG. 10.—Advance dressing station. First stage. *A*, area for patients awaiting attention; *B*, dressing table made by a stretcher or a few boards on trestles covered by oil silk or old sheet, also trestles to hold stretcher while patient is being dressed; *C*, area for patients awaiting evacuation; *D*, area for ambulances to turn and wait.

warmth to patients not only in the dressing room but also while they wait attention and afterward evacuation. The following points are kept in mind

when selecting the site for such a station as here shown: It should be beside or near a road which

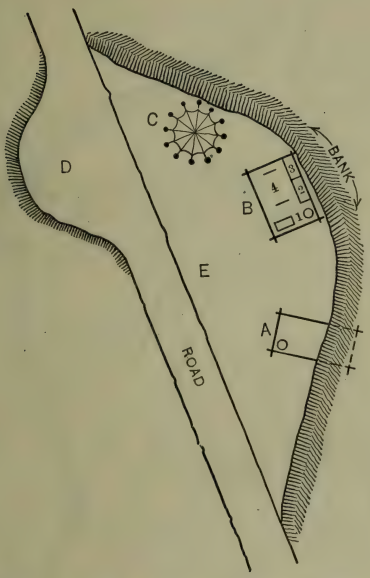

FIG. 11.—Advance dressing station. Second stage. *A*, shelter for patients waiting, partly dug into bank, a brazier in corner to keep it warm; *B*, rough building made from material salvaged in vicinity; 1, "Soyer" stove to warm hut and heat water; 2, dressing table; 3, pile of blankets; 4, trestles for stretcher; *C*, bell tent erected for overflow; *D* and *E*, areas for ambulances to turn and wait.

is not in view from the enemy's trenches and can be used by wheeled transport both by day and

night; it should be as close as possible to the route used by the infantry going to and from the trenches; it should not, during an offensive, be in a village

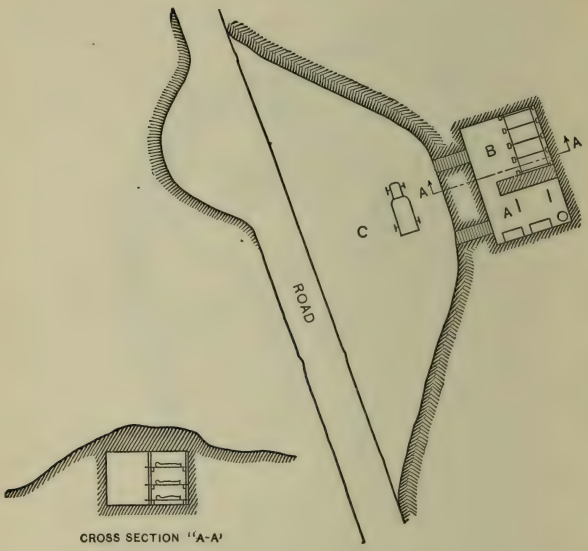

FIG. 12.—Advance dressing station. Third stage. Shows dugout. *A*, dressing room; *B*, waiting room, racks hold twelve stretchers; *C*, area for ambulances to turn and wait.

or wood, as such places in newly captured ground receive marked attention from the enemy's gunners.

Fig. 13 shows a dugout system off a communication trench. Such a series of small dugouts is con-

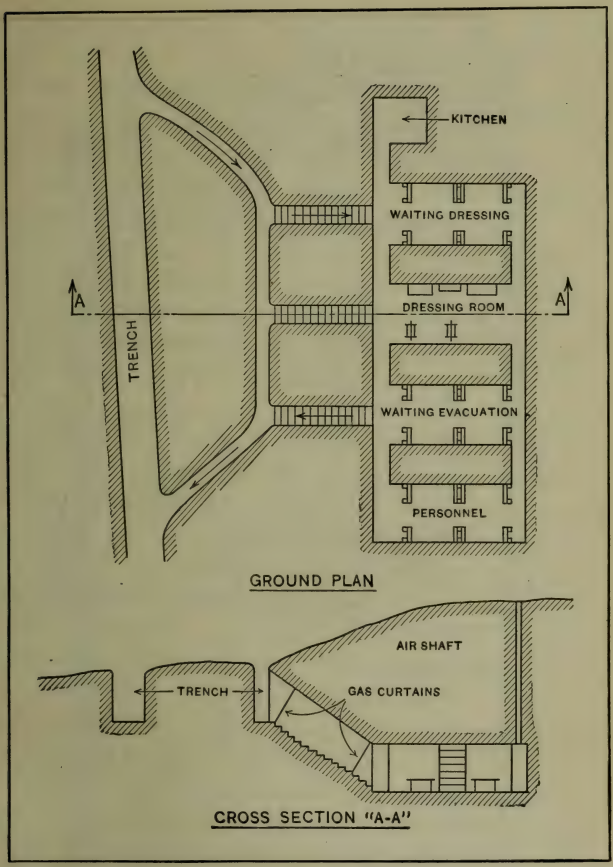

FIG. 13.—Advance dressing station in deep dugout system. Shafts lead down from trenches to four dugouts, connected in front and behind by corridors. Air shaft and gas curtains are shown in cross-section; also dressing room, with shelves for dressings, etc. Racks are constructed to hold two stretchers lengthwise and three high on each side of dugouts.

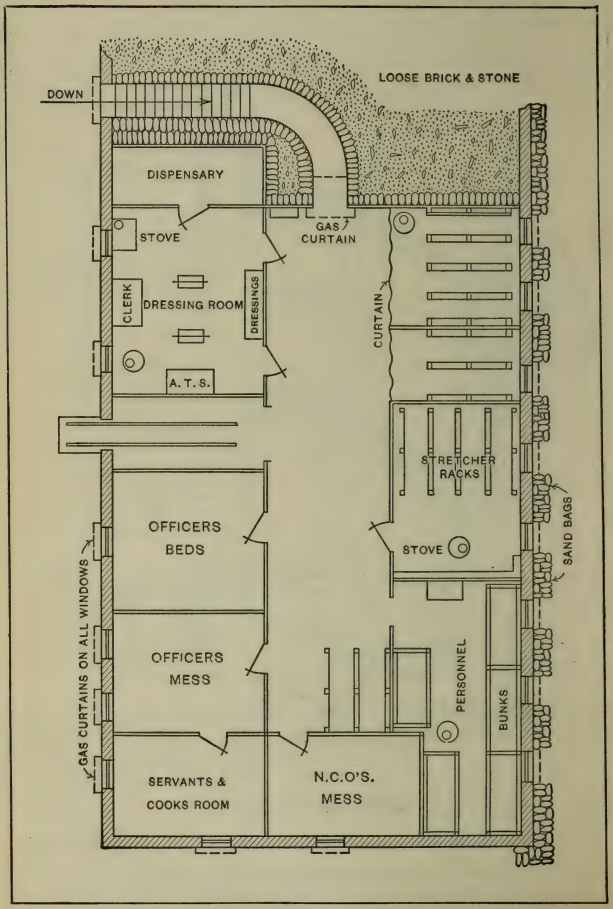

FIG. 14.—Advance dressing station established in cellar of battered building. *A. T. S.*, antitetanic serum table.

sidered safer than a single large one. Leading down to it are saps, each provided with its gas curtain. The passage along the back greatly improves the ventilation and affords easier communication between the individual dugouts. Racks are constructed, each holding 3 stretchers, and the portion set apart for the accommodation of personnel may also be used for patients during an offensive, thus housing in all 36 stretcher cases.

The last illustration (Fig. 14) shows what may be done in arranging an advance dressing station in the cellar of a ruined factory or other good-sized building. It is partitioned into compartments. During trench warfare the dressing room and one of the other compartments only need be heated. If additional accommodation is required a second and third will also be warmed. Without these partitions it would be hardly possible to keep such a large space at a proper temperature with the amount of fuel ordinarily available. The space allotted to officers and other ranks of the personnel is turned over to patients during an offensive. The cookhouse is not shown, as it is usually situated on the first floor or in another building.

While trench warfare continues the advance dressing station will probably consist of one section of the field ambulance, which may, however, be reinforced by further personnel from a bearer subdivision should this be necessary.

The sick usually come in during the morning, being sent down from the sick parades of battalions in the trenches and artillery batteries. They also come from detached parties, such as machine-gun companies, which have no medical officers and whose patients must therefore attend the sick parade at the nearest advance dressing station. Wounded arrive at any hour of the day or night.

An advance dressing station is merely a glorified aid post, in so far as treatment is concerned, but it has more personnel, more accommodation, more equipment and better facilities for making its patients warm and comfortable. When the wounded arrive they are immediately seen by the medical officers on duty, who ascertain their condition and do any further dressing that may be thought advisable. Casualties suffering from shock, except in the case of abdominal injuries, are retained and treated until sufficiently recovered to be safely moved. The severely wounded, particularly abdominal, head, and fracture cases, are sent direct to the casualty clearing station. The less seriously wounded and sick go by routine cars or walk to the main dressing station of the ambulance. All patients receive at least 750 units of antitetanic serum, and have a large "T" marked with indelible pencil on one wrist to show this has been done. If morphin is given, a large "M," and the fraction administered, is marked on the

forehead. Moribund cases are always held, and should the patient die, his personal belongings are carefully collected, a list is made out, and they are parcelled for transmission by way of the main dressing station to the adjutant-general's branch at the base. The body is taken to the mortuary, the main dressing station of the field ambulance and orderly room of the patient's battalion are notified, particulars being given of name, number, religion and disposal of the body, so that arrangements may be made for burial by his regiment. A record of all patients dealt with is kept by means of a nominal roll, which gives the diagnosis and disposal. An "admission and discharge book" is kept for patients sent direct to the casualty clearing station and all dying at the advanced station. In other words, there is an entry made in the admission and discharge book for every patient who does not go to the main dressing station, for the information of that station.

Two or more motor ambulances are at this dressing station, each with two drivers and one medical orderly, to transport casualties to the main dressing station and to the casualty clearing station.

THE MAIN DRESSING STATION.—This is also the headquarters of the field ambulance, so that whatever other fission or fusion takes place between subdivisions and sections it will be found that one tent subdivision, carrying the commanding officer,

the quartermaster and the sergeant-major, always forms part of the main dressing station. With peace conditions the personnel will probably represent a section, while, should work be at all heavy, another tent subdivision may be added. It is frequently established in a village, where a schoolhouse, chateau or factory, affording accommodation for some 100 patients, is occupied, the personnel being billeted near by. On the other hand, it may be situated in hutments or tents. Local geography largely determines position, but, as a rule, if at all possible it should not be more than three miles behind the front, otherwise transportation from the advanced station may be delayed.

Wherever it be located, in buildings, huts or tents, its arrangement is planned with a view to the definite division of labor into: (*a*) the reception of casualties, (*b*) their treatment, and (*c*) their evacuation. This differentiation may be noticed in the preceding diagrams of advance dressing stations, and is attempted in all medical organizations, ranging from the regimental aid post to the casualty clearing station. During an offensive it would be impossible to deal with the large number of wounded, and prevent the mingling of treated with untreated patients if such a separation were not made. This feature in its organization might be thought unnecessary to the successful handling of the ordinary sick and wounded under peace

conditions. Remembering, however, that raids or a gas attack may result in its being called upon to deal with numbers, which for a short time approach, if not equal, those dealt with under battle conditions, this arrangement may be considered as a measure taken to prevent disorganization during emergencies.

The plan of a main dressing station varies so much in detail on account of the variety of buildings that are used for accommodation that it is inadvisable to attempt any diagram of its general scheme other than such as might be afforded by Section II of Fig. 15, given later to illustrate a rest station.

It has been seen how the advance dressing station roughly divides the foot from the wheeled transport, and the main station is also a point of demarcation in the carriage of casualties. The field ambulance cars convey them to it, while the motor ambulance convoy, which is an army unit, collects patients from it and is responsible for their further movement to the casualty clearing station.

It has also been seen that to facilitate rapid transport to a thoroughly equipped hospital the severely wounded are generally sent direct from the advance dressing to the clearing station, while those suffering from shock and the moribund are retained. It may thus happen that only the ordinary wounded, which are, of course, the large percentage of all, and the sick go to the field ambulance

headquarters. To these are added the sick which come in from battalions in the rest areas and various other units in the vicinity.

Patients, as they arrive, are seen by a medical officer in the reception room, and classified into three groups:

(*a*) Those who will be fit for duty in two to four days. These go to the wards for treatment.

(*b*) Those who may be expected to recover in from four to fourteen days. These are transferred to the rest station.

(*c*) Those who will not be fit within fourteen days. These are evacuated to the casualty clearing station.

In practice it will be found that the wards of the main dressing station form a little cul-de-sac off the channel of evacuation of casualties, where those suffering from minor ailments, and admitted as sick, receive attention during their short stay. As the average number from a division in the field of those ill enough to require hospital care is not high, the dressing stations can accommodate all needing not more than four days' treatment, while passing others to the rest station and those more seriously affected to the casualty clearing station. It therefore follows that so far as the wounded are concerned the ambulance headquarters is simply a place where they are sorted for casualty clearing or divisional rest station, are fed and made com-

fortable, their wounds redressed if necessary, and antitetanic serum given should its injection have been previously omitted.

The motor ambulance convoy people send a despatch rider at noon each day to ascertain the numbers of sitting and lying cases to be disposed of from the main dressing station, and at 2 P.M. send the necessary cars to transport them.

The headquarters is the center for all records in regard to patients of the field ambulance, and the admission and discharge book kept here is completed by that from the advance dressing station, which notes patients not evacuated to the headquarters. The records will show the eventual disposition of all admissions as: evacuated to casualty clearing station; transferred to rest station; discharged to duty or died in the field ambulance.

THE DIVISIONAL REST STATION.—The function of this establishment is to drain from the general run of sick and wounded such as are expected to be fit again in from four to fourteen days, and meanwhile require but little medical treatment. These are thus expeditiously returned to their respective units, instead of cumbering the casualty clearing station, and being evacuated from it to the base with consequent delay. The type of case that here receives attention may be illustrated by a few ailments taken haphazard from the wards: trench

fever; muscular rheumatism; severe cold; sprained ankle; inflamed eyes; boils; barked and bruised shin. From this it is evident that it is more the sick and injured than the sick and wounded who are here cared for.

It may be situated in a chateau or other building or possibly be an enlargement of a former dressing station. The bed capacity is generally something over 200. Various essential points are brought out in Fig. 15, which represents it as occupying hutments.

Under Section I is the transport with horse lines and vehicle parks.

Under Section II are the administrative buildings, originally forming a main dressing station during trench warfare, but later converted to the present use.

Huts B and C have been added for the accommodation of those requiring more particular medical treatment, one of these being reserved for senior non-commissioned officers.

DESCRIPTION OF FIG. 15.

Section I: *A*, motor ambulances; *B*, wagons, etc.; *C*, feed house; *D*, harness room; *E*, farrier; *F*, latrine; *G*, horse line. Section II: *A*, latrine; *B*, N. C. O.'s; *C*, temporary patients; *D*, quartermaster's stores; *E*, dispensary; *F*, office *G*, reception room; *H*, pack store; *I*, cook house; *J*, dining room; *K*, work shop; *L*, incinerator; *M*, latrine; *N*, ablution benches. Section III: *A*, *B*, *C*, *D*, wards; *E*, dressing room; *F*, *G*, *H*, *I*, wards; *J*, dining room; *K*, recreation room; *L*, ablution benches; *M*, kitchen; *N*, dining room; *O*, cook house; *P*, bath house; *Q*, latrine.

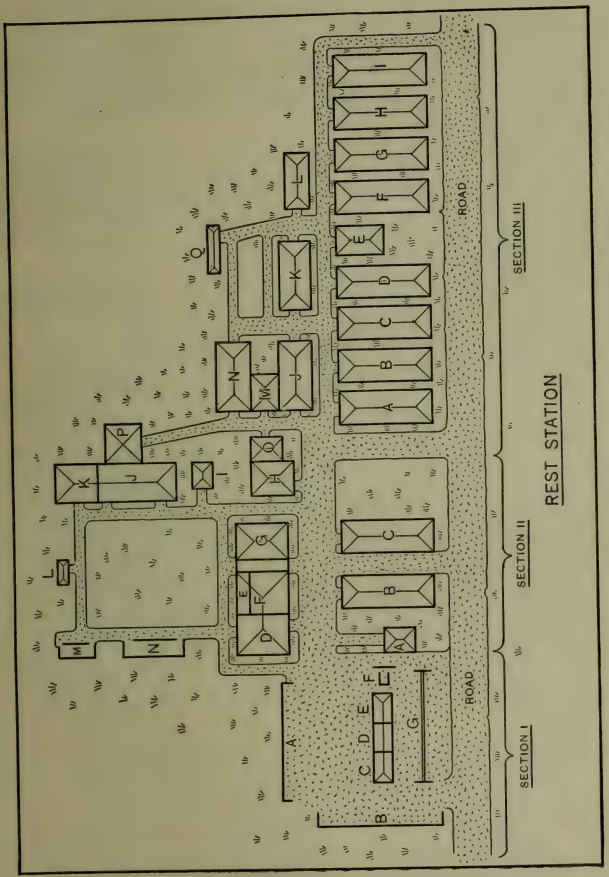

FIG. 15

The quarters for the personnel might be shown under this heading, but may be in other buildings.

Under Section III are the additional wards, kitchens, etc., provided when this site was chosen for a rest station.

The path in front of the huts is wide enough to be used by motor cars, so that if necessary the rest station can be transformed into a main dressing station during an offensive.

For purposes of records it may be regarded as two units: (*a*) a field ambulance and (*b*) a rest station operated by a field ambulance. The field ambulance holds a morning sick parade for men from detachments and small units in the vicinity and for those sent in by the medical officers of troops in the area. Those who require hospital treatment are shown on the books of the field ambulance as admissions, and if sent to the casualty clearing station are shown as evacuations to it. If, on the other hand, they are sent to the wards they are shown as transferred from the field ambulance to the rest station. It is therefore evident that patients are not admitted directly to this station.

The medical officers in charge of wards make rounds every morning, order treatment, select patients who are fit for discharge to duty and those who require further treatment in a casualty clearing station.

When the rounds are finished, all men to be discharged to duty are paraded, inspected and supplied with new clothing where necessary. They are then warned to be ready next morning for transportation to the various units to which they belong.

At noon each day a wire is sent to the assistant director of medical services of the division stating the number of vacant beds that will be available next morning. Each field ambulance, at the same hour, advises the assistant director as to the number of patients there awaiting admission to the rest station. From the information obtained by these wires the assistant director makes out his own list and at 6 o'clock notifies the rest station as to the number of patients they are to collect from each field ambulance the following morning, and also each field ambulance the number of patients which will be collected. As in the case of the main dressing station, a dispatch rider from the motor ambulance convoy calls daily at noon to ascertain the number of cases awaiting transport to the casualty clearing station, and at 2 P.M. these are collected by the motor ambulance convoy cars.

THE SCABIES HOSPITAL.—In some corps patients suffering from itch are treated in the rest stations; it is, however, much more common to find a separate establishment for the care of this disease. It is usually a small hospital of 50 to 100 beds, and must have good bath accommodation and a large disin-

fector. The average clientele varies, being larger in winter than in summer, but would probably be about 50 men per division. Officers suffering from this disease are sent to a casualty clearing station for treatment.

The average stay in hospital is about ten days, but should an offensive occur, all patients are turned out to full duty, and none suffering from the disease are admitted until active warfare ceases.

THE MOTOR AMBULANCE CONVOY has been frequently alluded to. It does not belong to the division nor even to the corps, but to the army. It is at present a medical unit under the command of an army medical corps officer, who is also provided with certain personnel from the same corps. These are, however, a small minority of the total strength, which is necessarily made up mainly of attached officers and other ranks from the army service corps.

A convoy consists of 50 motor ambulances, 2 motor cars, supply and workshop lorries, together with motor cycles for the dispatch riders.

There are several convoys with each army in the field, and they receive instructions from the director of medical services of the army with which they happen to be. He details convoys to be responsible for the evacuation of casualties from specified areas. These convoys, under normal conditions, transport the sick and wounded from main dressing stations,

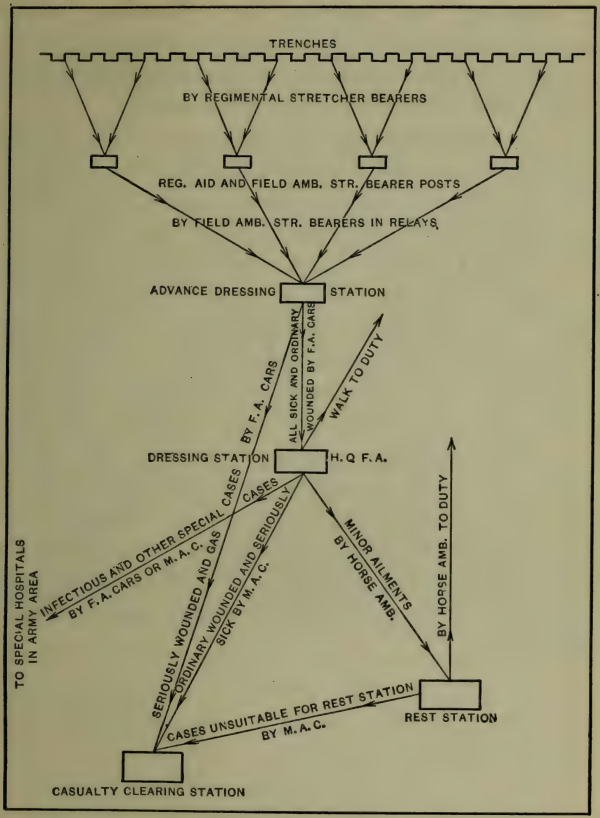
TRENCHES
BY REGIMENTAL STRETCHER BEARERS
REG. AID AND FIELD AMB. STR. BEARER POSTS
BY FIELD AMB. STR. BEARERS IN RELAYS
ADVANCE DRESSING STATION
ALL SICK AND ORDINARY WOUNDED BY F.A. CARS
BY F.A. CARS
WALK TO DUTY
DRESSING STATION
H.Q F.A.
INFECTIOUS AND OTHER SPECIAL CASES BY F.A. CARS OR M.A.C.
SPECIAL CASES
SERIOUSLY WOUNDED AND GAS
ORDINARY WOUNDED AND SERIOUSLY SICK BY M.A.C.
MINOR AILMENTS BY HORSE AMB.
BY HORSE AMB. TO DUTY
TO SPECIAL HOSPITALS IN ARMY AREA
CASES UNSUITABLE FOR REST STATION BY M.A.C.
REST STATION
CASUALTY CLEARING STATION

FIG. 16.—Movement of casualties by hand and wheeled transport. *H. Q. F. A.*, headquarters field ambulance; *M. A. C.*, motor ambulance convoy. Note that infectious and some other special cases go direct from main dressing station to special hospitals.

rest stations, and, during an offensive, walking wounded stations to the casualty clearing station. They also do much work in relieving the last named by the further conveyance of wounded.

The movement of casualties to the rear, whether by hand or wheeled transport, has so frequently been mentioned that it seems advisable here to recapitulate in diagrammatic form the facts already given. Fig. 16 shows upon whom rests the responsibility for transportation of patients, at each stage in their journey, from the trenches to the casualty clearing station, during conditions of trench warfare. It also illustrates how certain patients are returned for duty to their units, and how others, judiciously selected, are side-tracked for treatment in the divisional area, thus reducing to a minimum the sick wastage of a division. For if a casualty once pass through the clearing station toward the base, he is struck off the strength of his battalion and so lost to the division; a reinforcement being required in his place.

THE FIELD AMBULANCE IN BATTLE.

With the beginning of an offensive the minor interests of medicine are discarded and all attention concentrated on keeping the line clear of wounded, while affording them proper care and treatment during their rapid evacuation.

The existence of scabies, broken dentures and bad eyesight, together with all trivial ailments, is ignored at such a time. Only the seriously ill go to the casualty clearing while the middle class of ordinary sick are sent to the rest station.

It is expected that a large percentage of casualties after applying the first field dressing, which every soldier carries, will be able to look after themselves in so far as getting out of the lines and making their way to a designated rendezvous is concerned. They are called the "walking wounded," and in order to relieve the advance and main dressing stations of these, and also to facilitate speedy transportation by the provision of another route of evacuation, a walking wounded station is established. Here these patients are collected, fed, attended to and forwarded by motor ambulance convoy cars, by motor lorries provided by the corps, or in some instances by the horse

transport of the field ambulances, to the nearest casualty clearing station. The walking wounded station is frequently established by the corps at some convenient central point, to which such casualties are directed from their respective divisions. At other times the assistant director of medical services of each division arranges for his own station. In the first instance the personnel and equipment are contributed by the field ambulances of one or more of the several divisions composing a corps; in the second, by one or more field ambulances of the division concerned. There is a good deal to be said in favor of either scheme, but for the present purpose it is supposed that the latter has been decided upon.

In like manner one main dressing station for all divisions is occasionally instituted by the corps, for which there is perhaps but little to be said, so that here also it will be described as a divisional arrangement.

In addition to receiving his instructions from the deputy director of medical services of the corps, who is his immediate medical superior, the assistant director knows all about the local geography and has carefully studied the traffic map. He has also ascertained the direction in which the division will attack, and its objective, and thus anticipated any change in the routes of evacuation of casualties resulting from an advance. He has made arrange-

ments to supplement the personnel of his three ambulances by medical officers brought from the less engaged units of the division. On the other hand, he informs himself as to whether he may be called upon to supply medical officers and men to supplement the staff of the casualty clearing stations. With such knowledge he is in a position to use his field ambulances to the best advantage, and his arrangements can now be considered under the following heads:

1. The advance dressing station.
2. The walking wounded station.
3. The main dressing station.

THE ADVANCE DRESSING STATION.—During an offensive the work of the field ambulance stretcher-bearers is multiplied many fold. In its performance they may be distributed under either of two systems. The first is simply an enlargement of the peace time relay practice: the four bearers responsible for the transport of wounded from the regimental aid post to the first relay post are doubled or even trebled in number, while the relay posts also receive an increased personnel. It will be remembered that a field ambulance bearer sub-division has 36 stretcher-bearers, forming 9 squads of 4 men each, which is called a stretcher-bearer section and has a sergeant in charge. This non-commissioned officer will keep in touch with the group of aid and relay posts for which his section

is responsible and see that the wounded are properly evacuated, while for each brigade area there is also a medical officer in charge of all bearers, who is detailed for this duty by his field ambulance, and here termed a stretcher-bearer officer.

In the second method the bearers work in parties covering the whole distance between the regimental aid post and the advance dressing station. They are then under the immediate charge of the stretcher-bearer officer, who makes the journeys with them.

Each system has its advantages and its disadvantages. In the first the bearers work in small numbers and the non-commissioned officers and men have an opportunity of using their own initiative. This scheme is also favored by the regimental medical officers, because their detail of bearers is never far from the aid post, and they feel that there is less danger of losing touch with the advance dressing station. On the other hand, the allocation of a sufficient number of men to each relay post ties bearers to individual points, some of which, with the progress of the offensive, may have more than they can do, while others will be comparatively idle. Under battle conditions there is also difficulty in the proper feeding of these scattered detachments. In the second system the stretcher-bearer officer has at all times close control of his bearers, and more immediate relief can be afforded to any overcrowded regimental aid post. He sees that his

men are regularly fed, and relieved when necessary, at such times as they return to the dressing station. The men gain knowledge of the country and can be detailed as guides to parties of prisoners, who often act as stretcher-bearers. The disadvantages are: the greater danger of losing touch with isolated regimental aid posts, and the increased work and responsibility of the stretcher-bearer officer, with the added danger of disorganization should he be killed or wounded. To sum up, it may be said that the relay system is probably the better where only a short advance is expected and a small number of wounded are to be dealt with, while the second system is more suited to large numbers of wounded and a rapid advance.

In either system the stretcher-bearer officer must see that his men use what he judges to be the safest route of evacuation, and that they are, if at all possible, regularly fed and systematically relieved. As soon as an advance justifies it, he applies to the officer in charge of the dressing station for wheeled transport to be used in front of that station; and when he finds that he is able to use such transport up to a place which appears suitable for a station farther advanced, he explains the situation to the officer in charge, who, if he approves the idea, sends a party forward to establish a temporary advance station. If the place is found satisfactory the whole personnel

will move up. The stretcher-bearer officer therefore fills a responsible place, where judgment as well as knowledge is very requisite. Upon two things he must continually inform himself: The first is the geography of the area in which the division is situated and that over which it hopes to advance. The second is the position of the front line. The hour after sunrise is the safest period for his pursuit of information.

If for such reasons as lack of shelter or that the roads are under enemy observation the advance dressing station is situated at any considerable distance from the line, it may be necessary to relieve the work of the stretcher-bearers by opening a collecting station. It will be located near a road leading from the front or perhaps beside a trench tramway. In the former case casualties will collect here during the day and be evacuated by wheeled transport after nightfall, or it may only be used as a loading-point for ambulances at night, the patients being carried by hand direct to the advance station by day. In the latter the patients will be conveyed by trucks, either to the advance station or to a point where ambulances can be used. The plan of such a collecting point is essentially the same as that of one of the cruder advance stations previously figured.

As casualties arrive at the advance dressing station they are immediately attended to, classified

and evacuated. Beef tea, hot coffee, etc., are provided, and those whose wounds require redressing are dealt with, while particular care is given to the proper splinting of fractures; but no elaborate surgical work is done, operative interference being reserved for cases of urgent necessity. During an offensive antitetanic serum is not administered here, but at the walking wounded and main dressing stations.

The wounded are classified and their transportation arranged as follows:

1. Walking wounded
2. Slightly wounded sitting

} Go to walking wounded station.

3. More seriously wounded sitting
4. Stretcher cases

} Go to main dressing station.

The stretcher cases and the more serious sitting cases are conveyed to the main dressing station by both motor and horse ambulances. The slightly wounded sitting are sent to the walking wounded station by horse ambulances and general service wagons. The walking wounded have most frequently to go afoot, finding their way by roads marked with directing flags.

During a battle it is evident that many casualties will be able to apply their first field dressing, or get a comrade to do so, and will then leave the front and find their way toward the designated walking wounded station. In doing this they may

turn up at a regimental aid post or a field ambulance establishment, at which, as was above seen, they are assisted and further directed to their collecting center.

THE WALKING WOUNDED STATION.—Houses, huts, tents, or any combination that can be improvised by the field ambulance at a suitable place are utilized for this station. Whatever its composition may be its arrangement will emphasize the division, previously explained, into a place where patients are received, a place where they are treated and a place where they await evacuation. Such a station entirely constructed of tarpaulins, tents and other equipment carried by a field ambulance is shown in Fig. 17, by which the method and character of the work can be made clear under the following headings:

(*a*) The wounded arrive in three ways: they may come direct from the front line without having passed either through regimental aid post or advance dressing station; they may come from the regimental aid post without having called at the advance dressing station; they may come from the advance dressing station by horse ambulance, general service wagon or walking. They immediately enter the reception shelters, and while waiting treatment rest on benches and receive food from orderlies in attendance. Ordinary medical comforts are not sufficient for these patients, who

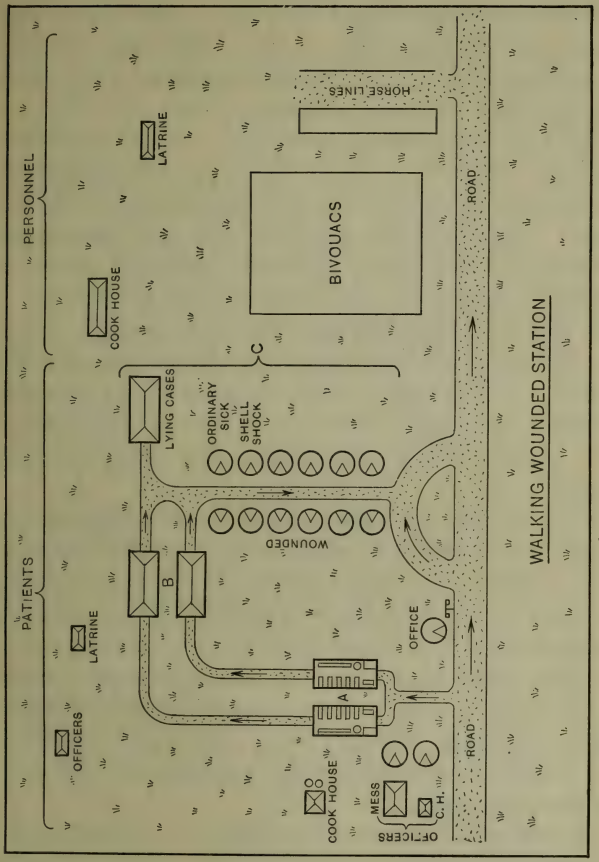
PATIENTS
PERSONNEL
OFFICERS
LATRINE
COOK HOUSE
LATRINE
HORSE LINES
LYING CASES
ORDINARY SICK
SHELL SHOCK
BIVOUACS
ROAD
WOUNDED
B
C
A
OFFICE
DTP
COOK HOUSE
MESS
OFFICERS
C. H.
ROAD
WALKING WOUNDED STATION

FIG. 17

frequently have eaten nothing for 12 to 18 hours, and require stew, bread and tea. The next most important desideratum is heat, for the wounded are always chilly, and even in summer it is advisable to have stoves or braziers going.

(*b*) The treatment consists in the necessary surgical attention, the injection of antitetanic serum and possibly the administration of stimulants. The dressings are carefully and thoroughly done here, and when possible suitable cases are marked "Need not be dressed for 24 hours," so that the casualty clearing station, if greatly rushed, may know that such cases are fairly safe for that period. While the patient is receiving treatment, orderlies, who act as clerks, take down the information necessary for the admission and discharge book.

(*c*) A certain number of walking wounded develop symptoms which render it advisable that they become stretcher cases. There is always a special tent set aside for these patients while awaiting evacuation. The great majority, who still remain walking wounded, also wait their transport in the tents of this section. All go to the casualty clearing station without delay, being conveyed by lorries and ambulances sent for the purpose by the motor ambulance convoy.

THE MAIN DRESSING STATION.—A description of this field ambulance headquarters during an offen-

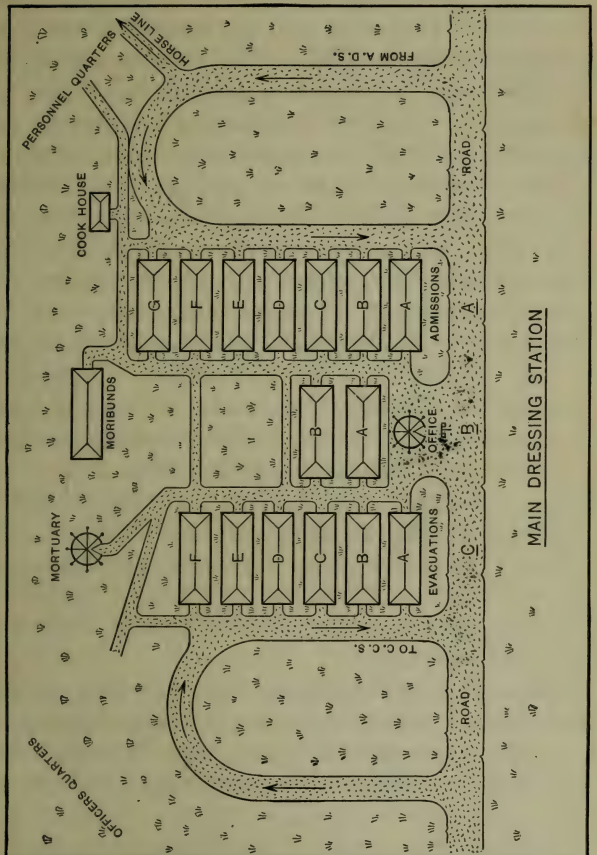
MAIN DRESSING STATION
ADMISSIONS
A
B
C
OFFICE
EVACUATIONS
MORIBUNDS
MORTUARY
COOK HOUSE
PERSONNEL QUARTERS
HORSE LINE
OFFICERS QUARTERS
TO C.C.S.
FROM A.D.S.
ROAD
ROAD

FIG. 18

sive will be more easily followed by reference to Fig. 18, which shows in a diagrammatic way the general scheme upon which it is usually arranged.

The admitting Section A is seen to have greater accommodation than the evacuating Section C, for if any block occurs it is usually because patients cannot be attended to as rapidly as they arrive. In the treatment Section B there are two dressing tents or huts, in each of which there are medical officers and orderlies, with two or more tables for dressing the wounded. There is also a tent or hut, well heated, for the detention and care of moribund cases; and finally a tent used for a mortuary. The evacuating Section C consists of tents or huts where patients are retained while awaiting evacuation to a casualty clearing or rest station.

As the ambulance cars arrive from the advance dressing station the wounded are seen by a "spotting officer," who distributes them in the following way:

1. Some may have died on the journey and are sent to the mortuary.

2. The apparently hopeless cases are sent to the moribund ward, where they are made comfortable, kept warm and given stimulants. Under this treatment many patients recover who would otherwise die.

3. Fracture cases and other seriously wounded are sent to wards E, F and G, Section A, to await

dressing in the hut or tent B, Section B, reserved for their treatment.

4. Less seriously wounded are sent to wards A, B, C and D, Section A, to await dressing in the hut or tent A, Section B.

The orderlies in charge of Section A make the patients as comfortable as possible and give them tea, oxo, etc., with the exception of those to be operated upon immediately. Here, unlike the walking wounded station, it is mainly medical comforts which the patients require and ask for. It is unwise to allow them solid food, as many will be given an anesthetic soon after they reach the clearing station. As it is impossible, when dealing with such large numbers of casualties, to select those who will certainly be operated upon, it is doing the greatest good to the greatest number to limit them all to medical comforts, of which tea is probably the best.

In the treatment Section B, all dressings are done and the patient's particulars taken meanwhile by the clerks, for entry in the admission and discharge book of the establishment. Fractures or other cases which are not here being operated upon, but who will most certainly be operated upon at the casualty clearing station, are not redressed if comfortable and the wound not bleeding. Others are dressed as well as possible, and suitable cases labeled "Need not be dressed for 24 hours." Anti-

tetanic serum is also injected, this being given here and at the walking wounded station during an offensive instead of at the advance dressing station, as in times of trench warfare.

Someone has said that the field ambulance should act as a "drainage company" in its surgical work as well as in its function of emptying the regimental aid posts; that its operators should open rather than close a wound, and, by providing for the full escape of discharges, counteract the almost inevitable infection that occurs in such battle injuries. The patient is rendered immune to lockjaw by his dose of serum, and will generally be saved severe wound infection by free drainage and careful dressing while on his way to the casualty clearing station.

Be this as it may, it is certainly incumbent upon the field ambulance to see that casualties leave its stations in as good condition for later operation as may be possible. In this connection the most urgent consideration is to combat "shock" from which all wounded suffer in more or less degree. As the main factors in its development are pain, cold, and loss of blood, the longer these are at work the greater the danger of death or subsequent widespread infection. Careful splinting of fractures, without undue movement; morphin; hot-water bottles; hot drinks; plenty of blankets, will save the lives of many. In regard to hemorrahge, it

should be the ideal of every field ambulance that no patient leaves with a bleeding wound, or, what is worse, a tourniquet.

As soon as dressings and other treatment are completed, patients are moved into the various wards of evacuation Section C and there await the cars of the motor ambulance convoy, which, during active warfare, call for them at frequent intervals.

In the foregoing account of the movement of casualties through the advance, walking wounded and main dressing stations the sick have, for the sake of clearness, been omitted. As a matter of fact, heavy fighting seems one of the best remedies for most of those who would otherwise appear at sick parade, and the chart showing curves for sick and wounded in a division will prove that as the latter index goes up the former goes down. There are, however, a certain number who feel too ill to continue, and so are forced to report; and it must be remembered that even during the fiercest fighting there remain several divisional units not engaged which continue to send in their sick. Again, it should be explained that as each battalion moves into the trenches it leaves behind, at the transport lines, about 100 men under a senior officer to form the nucleus of its further existence should it meet with disaster. This is called its "B. Echelon," and will also contribute its quantum of sick.

The seriously sick arriving at the advance station are sent to the main dressing station and through it to the casualty clearing station. The ordinary sick, whether sitting or walking, go from the advance to the walking wounded station. The latter station also holds the sick parade for men from the "B. Echelons" and various other transport lines. From here again the seriously ill go to the clearing station, while all ordinary sick are evacuated to the rest station by field ambulance cars if the motor ambulance convoy is unable to supply the necessary transport.

THE SELECTION OF FIELD AMBULANCE POSITIONS.

THE more important factors taken into account in selecting positions and assigning work to field ambulances may best be indicated with the assistance of a map.

A division during quiet times might probably occupy a three-brigade front such as shown previously in Fig. 4 and here repeated (Fig. 19), for the purpose of indicating the lines of evacuation of casualties under such local conditions.

The regimental aid posts of battalions in the fire trench are seen to be farther forward than those serving battalions in the reserve. Each has a field ambulance stretcher-bearer post beside it, with 4 bearers detached from the advance station to which its sick and wounded are evacuated. A relay post is shown on the right.

The field ambulance, marked by a circle, is responsible for the brigade on the left, and has an advance dressing station, composed of one of its sections, in a village on the main road of that side. From this point casualties, not in the category of seriously wounded (who are sent direct to the casualty clearing station) are conveyed by the ambulance cars

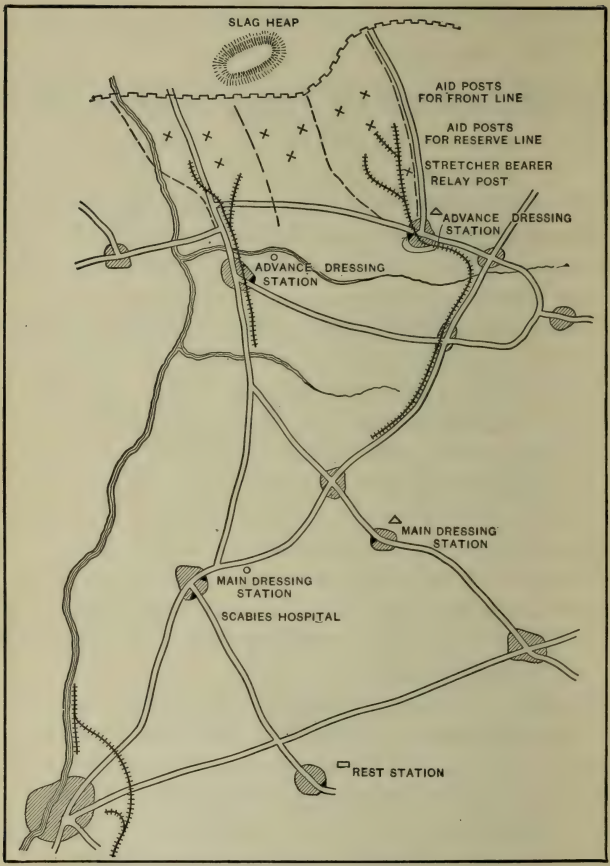

FIG. 19.—Divisional area, showing medical arrangements during trench warfare.

to its headquarters, situated in another village a couple of miles to the rear. A second section operates this main dressing station, while the third runs a scabies hospital in an adjacent building.

The field ambulance, marked by a triangle, is responsible for the sick and wounded of the center and right brigades. It also has an advance and a main dressing station. The personnel of the former is composed of one section and supplies 4 bearers to the relay post as well as to each of the aid posts which it drains. The latter, having the casualties of two brigades to handle, retains 2 tent subdivisions and 1 bearer subdivision, while the remaining bearers are in rest, or possibly detailed to assist at baths.

It will be noticed that the right advance dressing station, in particular, is some distance from the front line. A more forward position is impossible owing to the fact that the two roads running toward the trenches are in full view of the enemy, from the slag heap behind his lines, and wheeled transport is therefore not permitted on them. If these roads were not so exposed the dressing station could not only be advanced but one could be established for each of the brigades.

The field ambulance, marked by an oblong, is not actively engaged in clearing the lines, but has charge of the rest station, and may, in addition, conduct some of the baths, and possibly a laundry.

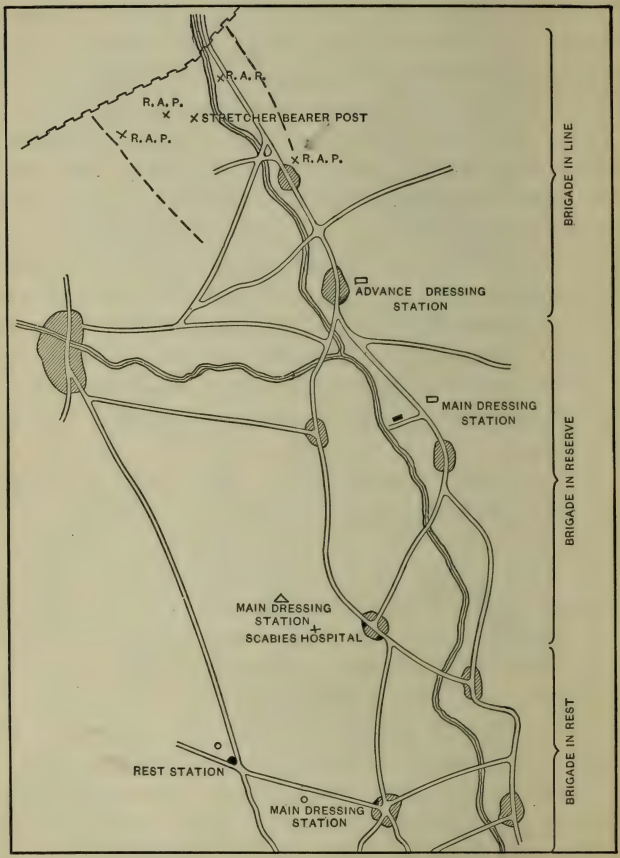

FIG. 20.—Divisional area with limited front, showing medical arrangements during trench warfare. *R. A. P.*, regimental aid post.

In the second map (Fig. 20) a division is shown as holding a front of small extent for trench warfare; there being only one brigade in the first line, with a second in the reserve, and the third in rest.

The field ambulance, marked with an oblong, looks after the brigade in the fire and support trenches. The regimental aid posts are situated in a little valley about 1000 yards from the fire trench, and as the roads are good and exposed to enemy observation at only one or two points, the ambulance cars can go up by day or by night. The dressing station has established in this valley a stretcher-bearer post that can accommodate half a dozen patients for a short stay, and is connected with it by telephone, so that a small ambulance motor car can be sent up at any time. The advance station might be located at the site of this post were it not for the difficulty of keeping cars standing near it; and once this situation is decided against, it had better be placed in the village as figured, as an additional half-mile or mile will, in this instance, make but little difference.

The field ambulance, marked with a triangle, attends to the brigade in reserve, and, not requiring an advanced position, operates only its main dressing station, together with the scabies hospital for the division.

The field ambulance, marked with a circle, is responsible for the brigade in rest, and, like the

other, has no advance station. In addition to its headquarters it looks after the divisional rest station.

With the preparation for an offensive the scheme of medical arrangements just studied will change into that illustrated in the third map (Fig. 21). Here the second brigade has been moved up to take part in the battle while the third is in the reserve line. An important consideration to the medical service is that only one good road is available for the transport of patients to the rear. Thus, while two advance dressing stations are necessary to keep the aid posts clear, there is no object in multiplying main dressing stations, and one is therefore made responsible for all casualties that may be evacuated to it. In order to relieve both advance and main dressing stations a walking wounded station must also be established at some convenient point on the line of general evacuation.

The profound change thus made in field ambulance arrangements can be judged by the marked alteration in personnel which occurs. One field ambulance, marked with an oblong, is now made responsible for the evacuation of sick and wounded from the front lines. It operates the two advance dressing stations, and for this requires the assistance of the stretcher-bearers and their officers, together with the motor ambulances, of the other two field ambulances.

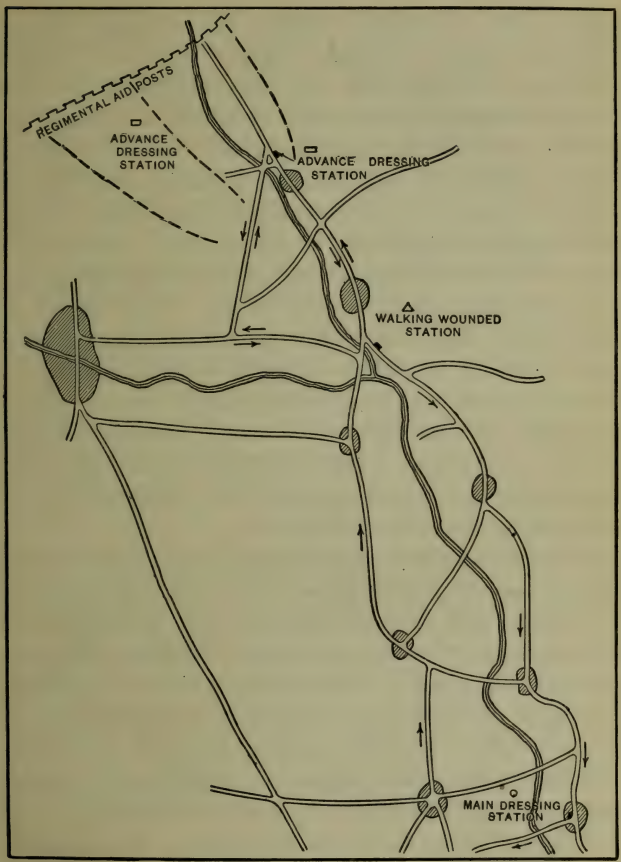

FIG. 21.—Divisional area (same as Fig. 20) during an offensive. Shows change in medical arrangements.

The second field ambulance, marked with a triangle, conducts the walking wounded station with its tent division. It has attached to it the horse transport of the other two field ambulances, in order to evacuate patients to the casualty clearing station. Should there be an advance and the line move forward, this transport will be used to bring walking wounded back to the station, whence they will then be conveyed to the casualty clearing station in lorries provided by the corps. The third field ambulance, marked with a circle, has charge of the main dressing station. Its staff is supplemented by medical officers from the divisional train, pioneer battalion and certain army units, such as bridging trains not engaged. The personnel of the divisional band and concert troops are also attached to it to act as stretcher-bearers.

It will be noticed that one of the advance dressing stations is moved forward to the site previously discussed, which was occupied by a bearer post, thus resuming its normal place between hand and wheeled transport. The other, which attends to the right brigade, is also near the front. Both must find the necessary accommodation in dugouts.

It is evident that field ambulance arrangements hinge on the character of warfare and alter with it from quiet times to battle methods. The extent of line and the number of brigades holding it are also of much import. Behind all is local geography, with

its considerations in regard to cover and enemy observation, roads, their number and condition, available buildings or sites for medical establishments, etc. These are all practical questions, to which the assistant director of medical services for the division makes practical replies by the proper placing of his ambulances and the correct apportionment of their duties. Even when this is done to the best advantage he has not finished, for there yet remains the possibility of an enemy attack suddenly changing trench conditions into active warfare, with the remoter contingency that it may be more or less successful. His arrangements for the moment must therefore always include a scheme for defensive operations.

To understand the plans that are made in anticipation of defensive warfare, an area occupied by a division under peace conditions, such as that before described, is referred to in the fourth map (Fig. 22). The following measures would here be taken:

(1) All stretcher-bearer posts are made large enough to accommodate a sufficient number of stretcher cases awaiting evacuation, so that the regimental aid posts may not be overcrowded. There is the added advantage that such distribution of wounded lessens the chance of having many killed.

(2) Arrangements are made with the officer in charge of the trench tramway that, if at all possible,

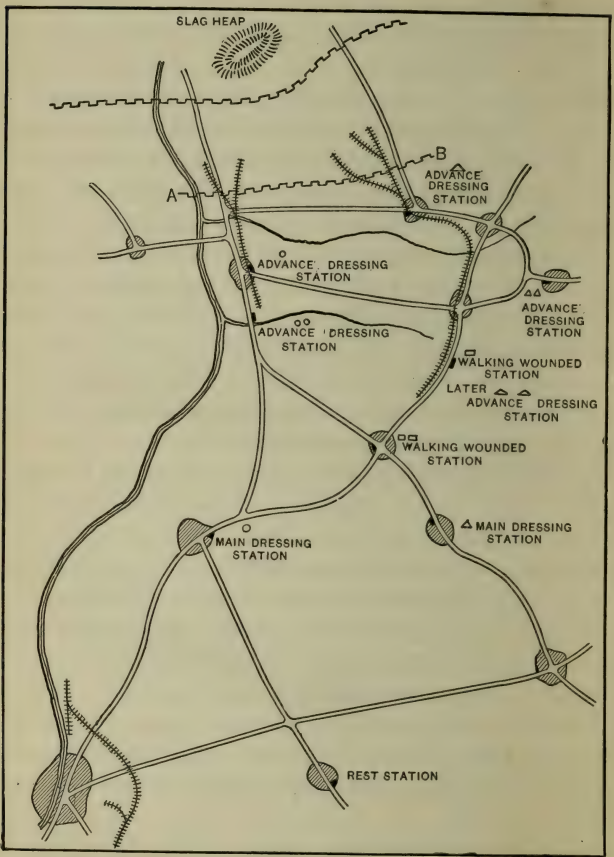

FIG. 22.—Divisional area (same as Fig. 19) during an enemy offensive. Shows change in medical arrangements, which are still further modified if enemy reach line *A-B*.

it shall be made available for use by the stretcher-bearers in clearing the wounded, and a certain number of cars fitted so that they will carry stretchers.

(3) Sign posts are painted directing the walking wounded to the station proposed for their collection and suitable points selected at which they may be erected if necessary.

(4) The commanding officers of the field ambulances are given full instructions as to the changes which must take place when they receive orders from the assistant director.

With the beginning of an enemy offensive in this area the probable medical rearrangement would be:

(*a*) All detached personnel return to their field ambulances without further orders from the assistant director.

(*b*) The field ambulance, marked by a circle, responsible for the left brigade, remains as it is, but devotes its whole attention to its advance and main dressing stations.

(*c*) The field ambulance, marked by a triangle, responsible for the two right brigades, remains as it is and operates its advance and main dressing stations.

(*d*) The field ambulance, marked with an oblong, leaves one tent subdivision to look after patients in the rest station; sends its bearer subdivisions and motor ambulances to reinforce the field ambulance

with the two right brigades, and with its remaining two tent subdivisions moves up and establishes a station for walking wounded, marked with an oblong, at a point where roads and tramway are convenient. The horse transport of all three ambulances is placed at the disposal of this station for the evacuation of the walking wounded to the casualty clearing station, as under the circumstances it will probably be impossible to obtain lorries for the purpose.

In any scheme for the evacuation of wounded following a surprise attack by the enemy it is very necessary that such should entail as little movement of units as possible. In the above the only marked change is the movement of two tent subdivisions of one field ambulance to establish a walking wounded station. The site chosen is the hutment built for a battalion in rest, so that the opening of this station is easy, provided that the commanding officer of the field ambulance concerned has previously worked out the details.

If the enemy enforce his will and compel retirement to the line "A-B" the medical rearrangement is more radical.

(*a*) The field ambulance stretcher-bearers drop back as soon as the regimental medical officer opens a new aid post to the rear of his former position.

(*b*) The advance dressing station on the left retires along its main road for about 2000 yards, and

again opens at a prearranged site in the little valley, marked with a double circle.

(*c*) The advance dressing station on the right falls back along its main road and takes up a chosen position, here shown as the former walking wounded station and marked with double triangles. This supposes both wings retire with the center, but should they hold while the center retires, and thus create an enemy salient, it may be thought advisable to open two advance stations on the right, the second being also shown by double triangles. The commanding officer of the field ambulance will here be greatly influenced by weather conditions, as in the position shown it would mean the evacuation of wounded by a third-class road.

(*d*) The walking wounded station takes up a new position, marked with a double oblong, at a point which now brings it into closer touch with the routes along which its patients will come.

THE ASSISTANT DIRECTOR OF MEDICAL SERVICES.

So much having been said concerning the interests and duties of the assistant director of medical services to a division, his exact position in the military hierarchy should be defined, and it appears opportune here to sketch the chain of medical responsibility in so far as it affects an army in the field.

Fig. 23 illustrates how responsibility for general policy and larger plans grows as it passes upward from the assistant directors of divisions, through corps and army, until it culminates with the Director-General of Medical Services at general headquarters. Reversely, how responsibility for detail and the practical administration of medical units in the field increases as it passes from above downward to the assistant directors.

The respective authority and responsibility of the several administrative officers forming the sequence, may, with the aid of the diagram, be briefly considered.

The commanding officers of the three field ambulances, together with the medical officers attached to battalions and other divisional units,

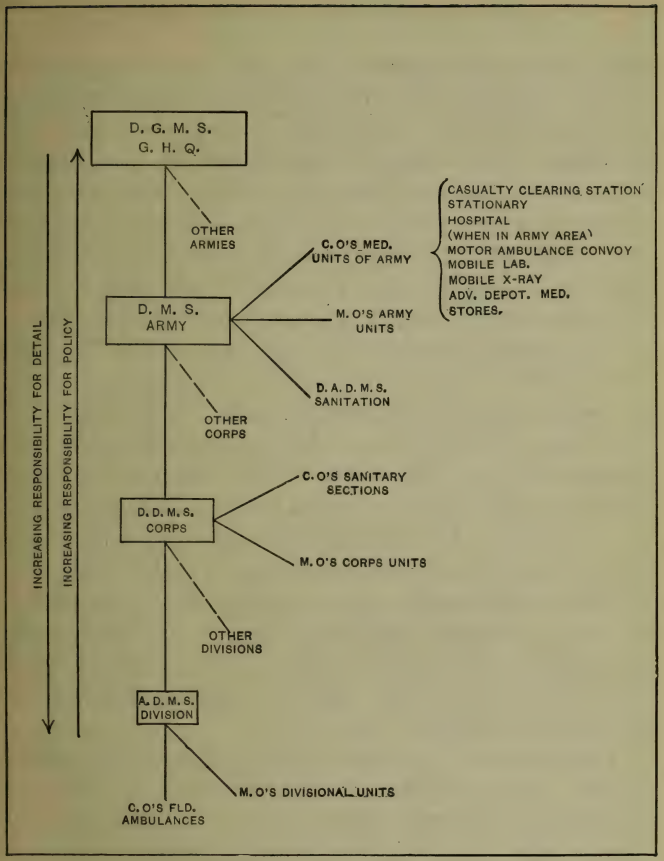

FIG. 23.—Medical organization in the field. *D. G. M. S.*, Director-General of Medical Services; *D. M. S.*, Director of Medical Services; *D. D. M. S.*, Deputy Director of Medical Services; *A. D. M. S.*, Assistant Director of Medical Services; *D. A. D. M. S.*, Deputy Assistant Director of Medical Services; *C. O.'s*, Commanding Officers; *M. O.'s*, Medical Officers.

take their instructions from and are accountable to the assistant director. While he has the immediate control of medical arrangements in the division, he is directly responsible to the deputy director of medical services of his corps for their proper conduct, and for the work of field ambulances and regimental medical officers. He communicates matters of importance to the deputy director and receives counsel, instruction and orders from him.

The deputy director of the corps is, in his turn, responsible to the director of medical services of the army for the administration of his assistant directors of divisions. He is, moreover, directly responsible for the work of the sanitary sections and medical officers of corps units. In this connection it should be remembered that if he decide in favor of a corps rest station or scabies hospital during peace warfare or a corps walking wounded, or corps dressing station during an offensive, the personnel, although drawn from various field ambulances, may for the time being, come under his administration.

The director is responsible for medical affairs in his army to the Director-General of Medical Services at general headquarters. This responsibility, like that of the deputy director, is both direct and indirect. He is directly responsible for such establishments as casualty clearing stations; stationary hospitals which may be in the area;

motor ambulance convoys and other medical units, together with the regimental medical officers attached to army formations. He is indirectly responsible, through the deputy and assistant directors, for the general conduct and control of all medical administration of corps and divisions in his army. In sanitary matters he has the advice of a skilled specialist, known as the deputy assistant director of sanitation, while corps and divisions are charged with the responsibility of carrying out practical details.

It is obvious that the various officers forming this chain of responsibility from below upward and of authority from above downward are not merely transmitters but each must add his own thought and action to that of the others.

Each of these authorities has one or more officers on his staff, to assist in administrative work and fulfil other duties which may be assigned to them. It is unnecessary to enter into the technicalities of the subject, but in the present case of the assistant director of a division there is an officer termed, like the sanitary adviser of an army, a deputy assistant director of medical services. These two administrative officers arrange their own headquarters conveniently to the divisional headquarters, of which they form the medical part. Here they deal with returns concerning sick and wounded; medical personnel with its wastage, etc.;

indents for medical supplies and equipment; requests and recommendations from regimental medical officers and those commanding field ambulances, together with a more or less varied correspondence. They keep in touch with divisional headquarters and adapt their medical arrangements to meet the exigencies of the military situation. They assist and direct field ambulances and medical officers in the performance of their duties or persuade of his error a recalcitrant brigadier-general, who persists in the belief that a field ambulance is part and parcel of his command, and must remain with the brigade under all circumstances.

THE CORPS.

With the growth of the army, old ideas of the numbers employed and their organization into wieldy formations become enlarged. The administrative unit was at one time the battalion, then the brigade and finally the division. Today military people are thinking more and more in terms of corps.

A corps was formerly defined as consisting of two or more divisions, but with the general increase of numbers its minimum has risen to three; and to this are added certain other arms and troops which now figure in its organization. Some of these corps troops were originally divisional, but in warfare such as the present, where divisions come into, take over and move out of areas with a limited front, it would be improvident to tie up troops which might or might not become or remain necessary to a particular division, but if such forces are under the corps they can be placed at any point where their peculiar function may be most required. Thus divisions have been dispossessed of their cavalry squadrons, more lately of cyclist companies, and so on, the necessary proportion being placed at the discretion of corps or army.

From another point of view it may be noted that with the growth in importance of the corps it seems probable that army units such as casualty clearing stations may yet come under its jurisdiction.

In its present organization, there are, over and above the three or more divisions, such formations as heavy artillery together with the ammunition park; mobile repair workshops for the mending of various guns; corps cavalry with a cyclist company attached to it; water-supply column, which carries water to the refilling point of any division that may be in an area where the supply is insufficient; labor battalions for the repair of roads or which are detailed to work under railway or engineer construction companies; sanitary sections, together with other corps units that need not be here detailed. For the transportation of supplies to all these there is the corps supply column, which in this case covers the whole distance between rail head and the various units.

As there is a divisional headquarters so there is the more important corps headquarters, which issues its orders to divisions, and is itself instructed by the army to which it belongs. Representing the medical side of the corps headquarters is the office of the deputy director of medical services. As already explained, he is in direct charge of the medical personnel of corps troops and is also responsible to the director for the efficiency of

medical units in the divisions which make up his corps. Coming under the former category are:

1. Medical officers of corps units.
2. Sanitary sections.

MEDICAL OFFICERS OF CORPS UNITS.—These are employed in the same way and have the same interests and obligations as the medical officers of divisional units, the only difference being that they are under corps, and so under the deputy director instead of the division and its assistant director.

SANITARY SECTIONS.[1]—These units were originally divisional troops, but it was found that the more or less frequent movement of divisions from one part of the front to another interfered with the efficiency of their work. The corps being a fairly stationary arrangement, it was decided that they should become part of its organization and so remain fixed as area troops, each section being responsible for its own sector of the front and the area behind it. These sanitary areas originally corresponded, and may still do so in places, with divisional areas; but owing to the expansion and contraction of divisional fronts during offensives, they seldom entirely agree.

Each section is under the command of a medical officer, who must be well qualified in sanitary

[1] War sanitation is fully dealt with by Lelean and others, and is here merely touched in passing.

science. His section consists of 25 non-commissioned officers and men, who are also selected with a view to their specialized duties; together with 2 other ranks attached from the army service corps. For disinfection of clothing, bedding, etc., he is provided with a Foden lorry, and for transport another lorry attached from the supply column.

This commanding officer, in his capacity as a sanitary officer, is the inspecting and advisory authority in regard to the sanitation carried on by units both in the trenches and in rest, to which must be added that of villages in the area occupied by troops. The personnel of his section are trained in sanitary duties, so that they may be detailed to instruct the sanitary men of units or supervise the work of men under the town major in villages. In regard to the latter it may be explained that a town major is appointed for each village or town and is given a staff[1] of "permanent base" men, the number of which will depend upon the size of the place. The town major is responsible for the billeting of troops in the village, and, under the direction of the sanitary officer, for its sanitation.

In all matters such as measures taken to prevent the spread of infectious disease from cases which occur; the procuring and protection of a good and

[1] Permanent base men are those who have been lowered in category as unfit for general service, but are still useful for certain types of work.

sufficient water supply; the disposal of refuse; the construction of incinerators or latrines and many other important matters, the sanitary section will advise, coördinate and, where necessary, assist. This section, being an area unit, must also see that the work of one division is not undone by the succeeding division, but that it continue on the proper lines toward improvement and completion.

Returning to the deputy director of medical services, it will be remembered that in considering the medical arrangements of a division it was seen how he might decide in favor of a corps rest station and a corps scabies hospital, thus replacing such divisional establishments. Also that in preparation for an offensive he might decide to have a corps walking wounded station, and possibly a corps dressing station, so again relieving the division of certain medical activities. The result of the greater thus assuming the prerogative of the lesser is that the deputy director, being without the necessary personnel, must borrow from his assistant directors, who are therefore called upon to contribute part or parts of their field ambulances.

There is much to be said in favor of a rest station and scabies hospital administered by the corps. One division might, for example, have a large number of minor cases requiring the care of its rest station, which would then be overcrowded, while another might have but few and its station

be almost empty. This disadvantage would be overcome by the corps establishment, which could average all these cases into comfortable accommodation. The same is also true of a scabies hospital.

The innovation of corps walking wounded and corps dressing stations was largely due to the fact that the casualty clearing stations, which are nominally mobile units, became immobile and failed to keep pace with the advance during an offensive. The main dressing stations being then within the fire zone, and unable to hold patients for any length of time, other units were established farther back, where suitable cases could be collected and detained before being evacuated to the casualty clearing stations. Useful though these innovations have proved on occasion, deputy directors are apt to forget that such units were organized for special emergencies and not to supersede the usual plan of divisional stations. Among their disadvantages is that of distance from the front line, for, except when the corps occupies a salient, it is impossible to make one point as convenient to all parts of the line as several points.

MEDICAL ARRANGEMENTS FOR CAVALRY.

THE medical arrangements in a cavalry division on the Western front are, at present, essentially the same as those which obtain in the infantry. It is only when cavalry is acting in an offensive as cavalry that the work of its regimental medical officers and field ambulances presents novel situations or new problems. For the purposes of this description it does not therefore appear necessary to go into the organization of a cavalry division, but rather to recall the few facts in regard to regiment and brigade that are of moment to the medical service during an offensive.

A brigade consists of 3 cavalry regiments and a machine-gun squadron, together with a signal troop, which, as in the infantry, maintains communication between the brigade headquarters and that of its division.

The cavalry regiment has 3 squadrons and each squadron has 4 troops. The total strength may be placed at about 550 of all ranks. These are provided with something over 600 horses, a machine gun to each troop and the necessary transport. The men are trained in the use of bombs, rifle,

bayonet and machine gun in the same way as infantry, so that they can efficiently take up a dismounted position after an advance. They carry lance or sword, rifle and bayonet.

The machine-gun squadron is a defensive unit, with duties similar to those of the machine-gun company in the infantry, but is supposed to take up a comparatively more advanced dismounted position. Its strength is upward of 250 of all ranks, with about 300 horses. It is divided into 4 troops, each of which is responsible for 4 guns.

The medical provision for such a force is one medical officer to each regiment and one cavalry field ambulance to each brigade. This ambulance differs in some respects from that previously described, so that a brief account of its organization is advisable, after which a scheme for the collection and evacuation of wounded during an offensive can be considered.

The cavalry field ambulance is a much smaller unit than the corresponding establishment with the infantry. The medical personnel consists of 6 officers, one of whom commands, and 70 non-commissioned officers and men; to which must be added, however, those attached with the transport from the army service corps. For like reasons to those considered in connection with the field ambulance this personnel is first separated into tent and bearer divisions, these being again split

into two subdivisions. A tent and bearer subdivision, taken in conjunction, form what is termed a section. As a final result the establishment assumes the formation shown in Fig. 24, which should be compared with that of Fig. 9.

Although the principle is not always adhered to in actual operations, it is intended that the horse and motor ambulances shall work with the bearer division and that the remainder of the transport, carrying medical and other stores, work with the tent division. The latter is also provided with 2 operating tents and 4 bell tents to serve as a field hospital, when houses or huts are not available or insufficient, thus affording accommodation for the official number of fifty patients.

The cavalry field ambulance, the regimental medical officers, with their orderlies and certain equipment, together with stretcher-bearers, of whom 4 are provided by each squadron, make up the immediate medical assistance to a brigade going into action. When a cavalry regiment enters upon an offensive its medical officer selects one of the four stretcher-bearers from each squadron, and with these, and his medical orderly and groom, "all mounted," follows the regiment in its advance. He knows its objective and is thus enabled to choose a suitable situation for his aid post. When the site is decided upon he immediately sends forward the three stretcher-bearers to get in touch with their

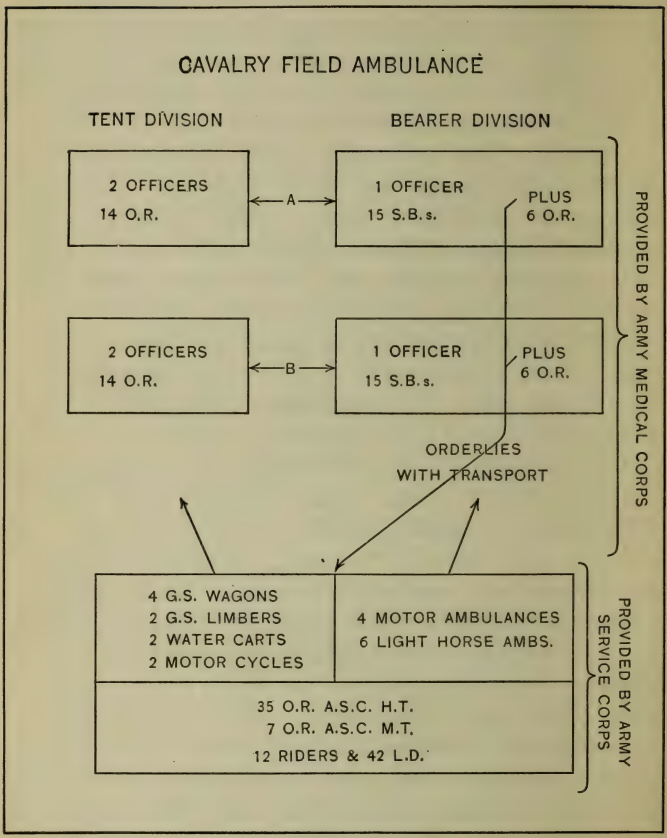

FIG. 24.—Shows complete personnel, both medical and those detailed from *A. S. C.*, together with vehicles and horses. *O. R.*, other ranks. *S. B.'s*, stretcher-bearers.

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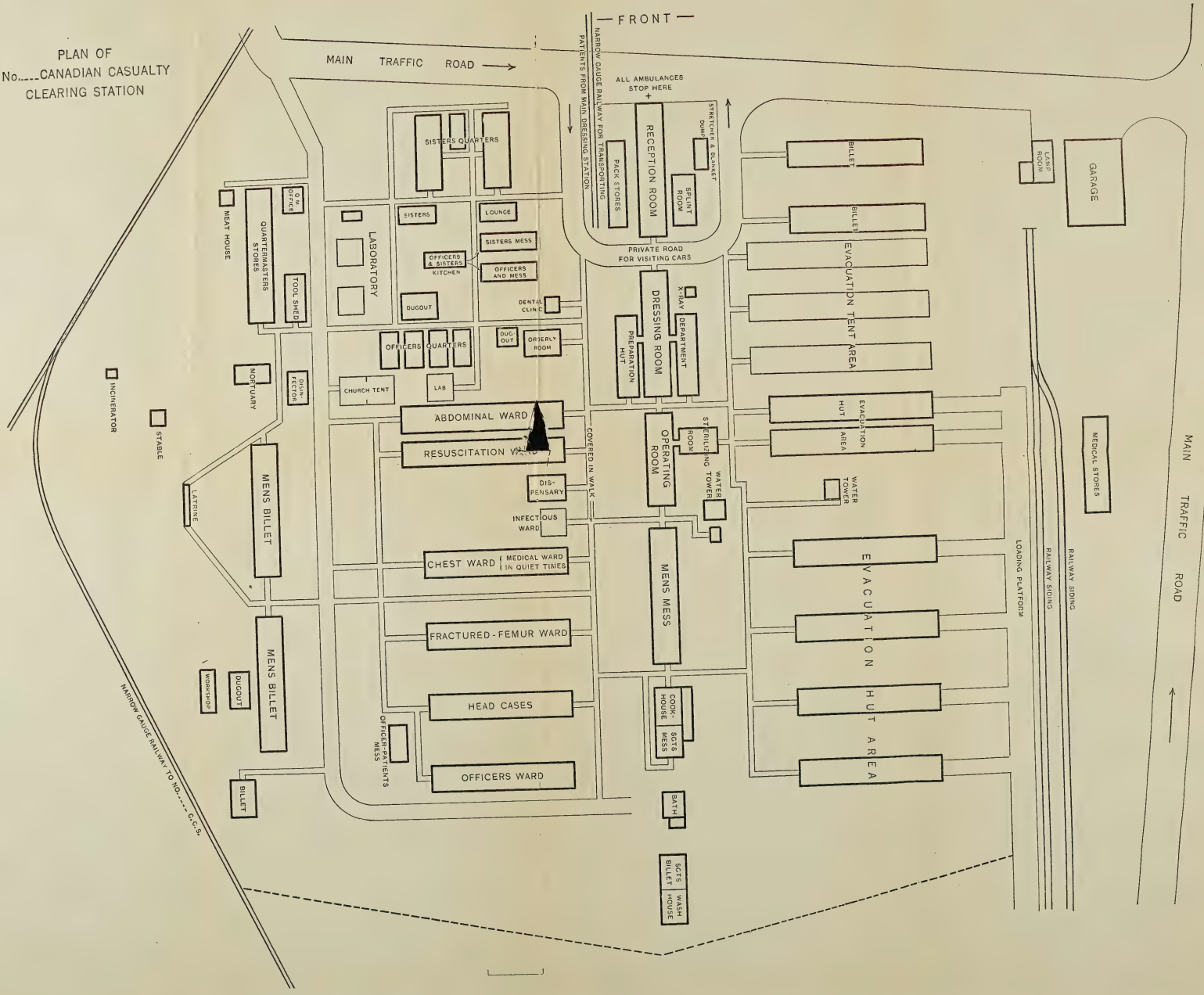

NOTE.—The Authors are indebted to Lt.-Col. C. H. Dickson, C. A. M. C., for his courtesy in supplying this plan.

squadrons. These bearers direct all walking wounded and troopers who have lost their horses, and are thus casualties, to the aid post. They remain with their respective squadrons and continue to direct walking wounded to the rear, and do not dismount until the unit has taken up a dismounted position. On this occurring they give their horses over to the horse-holders or turn them loose, and begin work, which is the same as that of the infantry stretcher-bearers.

Meanwhile the medical officer uses his groom and orderly to keep in touch with the pack section of the field ambulance, which is following, and brigade headquarters. So far as is possible the walking wounded are gathered in small parties and placed in charge of a senior wounded or unwounded trooper. A signal is put up, such as a dressing or bandage on a pole as a guide to the pack section of the ambulance. The medical officer, receiving information as to the position of his regiment, will probably again move forward, leaving little groups of wounded at convenient points, but meanwhile allowing the more seriously wounded to remain where they have fallen for collection after the action.

The cavalry field ambulance follows the forward movement in echelon.

THE FIRST ECHELON OR PACK SECTION.— Stretcher-bearers, under a medical officer, are sent

forward with dressings and stretchers on one or two pack horses. During the advance they travel with or near the brigade headquarters and keep in touch with medical officers of the various regiments. They form the small parties of wounded into larger parties near or beside a road which can be used by horse transport. These are left in charge of the senior wounded or unwounded soldier to be later picked up by the horse transport section of the ambulance. The pack section continues to advance until it reaches a position suitable for a collecting station at such time as the brigade may take up a dismounted position. Not until the brigade has taken up such a position do the stretcher-bearers of the regiment or the stretcher-bearers of the pack section collect the lying wounded.

THE SECOND ECHELON OR WHEEL TRANSPORT SECTION.—One medical officer, the remainder of the stretcher-bearers and 3 or 4 men from the tent subdivision, with a limber containing dressings and splints, move up to establish an advance dressing station as far forward as possible. The light horse ambulances also take part and collect the groups of wounded left by the pack section, bringing them to the advance dressing station. When the brigade takes up a dismounted position the stretcher-bearers rejoin their comrades in the pack section and form the stretcher-bearer party to carry the lying wounded. At the advance dressing station

a certain number of wounds are dressed and limbs splinted, and these casualties are then sent back to the main dressing station in motor ambulances.

THE THIRD ECHELON OR FIELD HOSPITAL SECTION.—This is the tent division, which establishes a small dressing station, similar to the main dressing station in an infantry division. The wounded are dressed and evacuated to a casualty clearing station by the motor ambulance convoy or by the lorries of the supply column returning empty to rail head.

If the cavalry remain in a dismounted position, the medical arrangements will again become similar to those in an infantry division. The pack section will move back or the second echelon will move forward, the two uniting to form the new advance dressing station, to which the wounded will be brought from the regimental aid post by field ambulance stretcher-bearers. The wounded will be taken to the main dressing station, which may or may not move forward, in horse and motor ambulances.

THE CASUALTY CLEARING STATION.

THE casualty clearing station is, to medical activities, the "great divide." On the side toward the front, professional interests are subordinated to the urgent necessity of keeping the lines clear of sick and wounded. This means the retention only of those who can quickly return to the fire trench or other duty, and the expeditious, though careful, evacuation of those whose man-power value is partly or wholly erased. On the side toward the base technical considerations are predominant, with the result that the special care and treatment of several types of injury and disease are begun. From a practical point of view, that of the patient, this arrangement is agreeable, for the quicker he gets out of shell fire, over the hump of the casualty clearing station and down the more peaceful lines of communication, the better is he pleased.

This position between front line and hospital conditions continually recurs to the mind when studying the administration and work of a casualty clearing station. At first called a "clearing hospital," its functions of rapidly sorting and evacuating casualties soon altered it to "clearing station,"[1] The pendulum of its work now swings between the two; during quiet times, when only the sick

[1] Such a unit is termed an "Evacuation Hospital" by the Americans.

and wounded incident to ordinary trench warfare arrive, it is much a hospital, its work resembling that done in stationary or general establishments; while during an offensive, with the inflow of battle casualties, it is very much a station, for like a field ambulance, but on a larger scale, it only holds for treatment certain selected cases (about 10 per cent.) and evacuates the remainder as quickly as possible. With these varying conditions its old limit of 200 beds is long since gone, and its capacity is now anything from a thousand upward. Formally a medical unit on the lines of communication, its increasing importance, together with the growth of army areas, in which in time it was always found, caused its change to an army establishment under the administration of the director of medical services concerned. The medical units of an army are usually arranged in groups, each group being responsible for a definite sector of the front. Such a group is composed of 2, 3 or more casualty clearing stations; a motor ambulance convoy; an advanced depot of medical stores; a mobile laboratory and frequently a mobile *x*-ray. The director of medical services is responsible for this grouping and for certain details of its work.

In addition to the units thus focussed the director may have one or more stationary hospitals under his authority. These establishments are useful for the reception of such special cases as "Not yet diagnosed nerve," often known as "shell-shock

sick" in contradistinction to true shell shock; "Pyrexia of unknown origin;" infectious diseases and self-inflicted wounds. As already indicated in Fig. 16, certain special cases go direct from the field ambulances to designated stationary hospitals, but the greater number are sent from the casualty clearing station. The director issues instructions in regard to them and arranges for their transportation by the motor ambulance convoy or occasionally by civilian trains, "Chemin de fer economique."

In order to coördinate the medical work of corps and army the director, from time to time, issues in his routine orders to deputy directors instructions and details of the arrangements made in regard to casualty clearing stations.

In examining the internal arrangements of a casualty clearing station it will again be helpful to emphasize by considering separately the methods followed during inactive warfare and the changes that take place to meet active conditions.

DURING PEACE WARFARE.

The staff required to meet the demands of quiet times is not large. It is generally made up of the officer commanding; 1 quartermaster; 1 surgical specialist; 1 anesthetist; 4 other medical officers; 1 dentist; 1 matron; 6 nursing sisters, and 80 non-commissioned officers and men.

The station is, as a rule, at least six miles from the front line and occupies a place in an army

group which is frequently accommodated in huts-ments or partly housed in huts and partly under canvas.

The arrangement of a well-planned casualty clearing station is illustrated in the frontispiece. It will be seen that in addition to ambulance transport there is a tramway system by which the wounded can come from the field ambulance when casualties are heavy. It is also in immediate contact with a railway siding, so that the movement of patients from the evacuation huts into the hospital train is easily made. Several dugouts are in evidence, this establishment having received some attention from the enemy. The left side of the plan, with its wards, dispensary, etc., suggests the hospital and its attention to patients; while the right, with its evacuation area, suggests the clearing station and rapid movement of casualties toward the base. The internal economy by which all admissions are expeditiously, yet methodically, sorted and disposed of toward left or right is better described under battle conditions.

In addition to the sources of supply mentioned under field ambulance arrangements, patients arrive from both corps and army units, so that sick and wounded are received as follows:

1. From advance dressing stations.
2. From main dressing stations.
3. From rest stations.
4. From medical officers of corps or army units.

The wounded who require further surgical attention are operated upon and held until considered fit for evacuation. The exact meaning of the phrase "considered fit for evacuation" varies from time to time, depending largely upon the number of casualties being received. All wounded who do not require surgical interference and all sick who are fit to travel, but who will not be fit for duty within three weeks, are evacuated to the base by the first hospital train. Sick who will be fit for duty within a period of three weeks may be treated at the clearing station. About 30 per cent. of the sick admitted are so held and discharged to duty. The casualty clearing station periodically receives orders from the director of medical services to clear, in which case patients who would otherwise be retained at this station are sent to the base.

The director is notified each morning as to the number of lying and sitting cases that await disposal, and, acting on this information, arranges the necessary transportation for evacuation to one or more of the following destinations:

1. Base hospital by hospital train.
2. Stationary hospital, lines of communication, by hospital barge or train.
3. Stationary hospital, army area, by motor ambulance convoy or civilian train.

Men belonging to units in the immediate neighborhood on being discharged to duty proceed on foot, while men belonging to units not in the imme-

diate neighborhood obtain their transportation through the railway transport officer.

DURING BATTLE.

With the beginning of an offensive the arrangements and work of the clearing station change from the stodgy to the interesting. The flow of battle casualties to the group has been provided for by the arrival of more motor ambulance convoys, motor lorries, and char-a-bancs, to which is added the active operation of the tramway system, should this be available. The personnel increases to a number limited only by what the commanding officer demands or by what the director is able to supply. They are mostly drawn from hospitals at the base or possibly on the lines of communication, but field ambulances may also be obliged to contribute, while additional stretcher-bearers are obtained from labor battalions and prisoners' camps. An outstanding feature is the "surgical team," made up of a surgeon, an anesthetist, a nursing sister and two orderlies, all specially qualified for their work. Usually several of these teams are sent to each clearing station behind a battle front.

All casualties, lying, sitting or walking, are brought to the reception hut (see frontispiece). Here clerks quickly obtain the names and necessary particulars for the records. The patients are then immediately taken by the stretcher-bearers to the dressing hut. This has 4 or more dressing tables

at one end while the remaining floor space will accommodate at least 50 stretchers. On one side, and connected with this hut by a short passage, is an operating annexe with *x*-ray apparatus at one end and 2 or more operating tables at the other. Off the dressing hut, on the opposite side, is the preoperation or preparation hut, with 4 tables at one end and again space for stretchers.

So important is the work of the dressing hut that either the chief surgeon or the second surgeon, properly assisted, are on duty here. As patients are brought in from the reception room their bandages are cut down and their wounds exposed by the orderlies in attendance. They are then examined by one of the surgical experts and classified and distributed under the following headings:

1. Those fit for immediate evacuation. If dressings are clean, they are often replaced, bandages applied and patients sent to the evacuation section. ("Area" in illustration.)

2. Those fit for immediate evacuation, but dressings soiled. Wounds are redressed and patients sent to evacuation section.

3. Those requiring minor operations, such as enlargement of wounds. Dressings replaced and patients sent to operating annexe.

4. Those requiring, and fit for, immediate operation. Dressings are replaced and patients sent to preparation hut.

5. Those suffering from severe shock, whether

requiring operation or not. These are sent to the resuscitation ward.

6. Those not to be operated upon, but who must be kept under observation until evacuation by the hospital train, such as head cases, certain fractures, etc. They are dressed and sent to wards kept for this purpose in the postoperative section.

It will be remembered that in order to assist the clearing stations in times of stress, certain selected cases were marked by the field ambulances "Need not be dressed for 24 hours." Notwithstanding this hint, an endeavor is always made by the surgeon to see the wounds of every casualty that passes through the reception hut to him; for it may happen that the slighter injuries, from their very insignificance, are neglected, become infected, and so perhaps serious. It is therefore only in times of severe pressure that these cases, together with those of the walking wounded, whose bandages are clean, who have no pain, and no obvious signs of trouble, are sent to the evacuation section without their injuries being inspected. The patients in the preparation hut have their uniforms removed, are put into hospital clothing, and, so far as possible, made ready for the operating theatre. While they wait, a small dose of morphin is frequently given, and if the ears be stuffed with cotton-wool, a remarkable number will rest, sleep, and take the anesthetic easily.

The resuscitation ward is probably the most

important of the huts reserved for special conditions. The medical officer in charge of this ward sees each patient as he is brought in and attaches a card, giving instructions as to the treatment he should receive and the number of the table in the operating room to which he will be sent as soon as he is resuscitated.

The operating room is a large hut, down one side of which extends a long table. On this, and facing each of the four to eight operating tables, there are small sterilizers for the instruments used at each particular table; while in an annexe are the large sterilizers for dressings. Here the surgical teams work in relays, there being usually from three to six busy at any given time. During every operation, a clerk, or more often the anesthetist, makes notes in regard to what is wrong, and the essential details of what is done. This information is entered on the man's "field medical card," which is then placed in its water-proof envelope and goes with the patient to the base.

After operation the patients may be sent direct to the evacuation section, but more frequently go to the postoperative wards. These consist of a row of huts, each accommodating some 40 cases. A nursing sister and two orderlies are on duty in each, and the medical officers detailed to the chest and resuscitation wards, are also available in case of emergency in any part of the section.

The evacuation section contains ample accommodation for all lying, sitting, and walking cases, but

there are no beds, as stretchers are used in readiness for entraining. The commanding officer generally makes this section his particular charge, and his chief surgeon also pays repeated visits, in order to make sure that none of those waiting disposal have developed symptoms necessitating further surgical interference. At the casualty clearing station, as at the dressing station of the field ambulance, food is an important desideratum in the care of wounded men. Arrangements are generally made whereby walking wounded can be fed while waiting admission, or else they parade later in the dining room. Nourishment is also taken to the lying and sitting patients in the evacuation section by means of food wagons, while each of the postoperative wards has its small diet kitchen.

During active warfare the clearing stations must notify the director of medical services every hour as to the number of lying and sitting cases awaiting evacuation at their respective establishments. The director then makes arrangements for the necessary hospital trains. There is supposed to be a casualty clearing station for every division in the field, so that a group of three such stations is expected to take care of all casualties arriving from a sector of front corresponding to a corps of three divisions.

It is evident that it is practically impossible for any clearing station to continue work indefinitely under the strain put upon it, particularly by battle conditions. Two arrangements to allow of some respite

are in vogue among the members of various groups. The first, usually adopted in peace warfare, is that one of the stations shall receive all patients arriving during twenty-four hours, evacuate them on the following day, and on the third clean up, rest, and get ready to receive again on the succeeding day. The second, generally adhered to during an offensive, is that each clearing station of the group, in turn, receives 150 lying cases, or the equivalent in lying and sitting, two sitting being considered as equal to one lying.

This completes the description of a casualty clearing station and its activities in so far as they touch upon the present discussion; but, in conclusion, some mention must be made of the action taken by the unit concerned in the temporary or permanent loss of the man who is a casualty.

When the sick or wounded man passes through the regimental aid post into any of the various establishments conducted by the field ambulance, and later, in most cases, to the clearing station, he is shown on the records of his unit as in hospital, but still remains on its strength. If not returned to duty by this station, but passed instead to a stationary hospital or the base, he is then struck off the strength of his battalion or other unit. It thus happens that when a casualty is evacuated for further treatment from the casualty clearing station he passes to that bourne from whence he may return only as a reinforcement.

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